

RESEARCHES IN STELLAR PHOTOMETRY

DURING THE YEARS 1894 TO 1906

MADE CHIEFLY AT THE

YERKES OBSERVATORY

BY

JOHN A. PARKHURST, S. M.,

Instructor in Practical Astronomy in the University of Chicago.



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RESEARCHES IN STELLAR PHOTOMETRY.

BY JOHN A. PARKHURST.

INTRODUCTION.

The problems of stellar photometry are closely connected with many cosmic questions, primarily with the light changes of variable stars; but they have an equally important bearing on the questions of stellar distribution and evolution. It has been said by good authorities that it is of more importance to measure the light than the place of a star, and if one considers merely the astonishing number of variable stars now being discovered, it will be admitted that the importance of stellar photometry can scarcely be overestimated. The material here submitted is the natural outgrowth of the writer's variable-star work, the plans being extended as the instrumental and other facilities were improved.

The following contribution is offered towards the solution of several photometric problems, among them being:

- (1) The accurate determination of complete light-curves of twelve variable stars of long period, having faint minima.
- (2) The question of the behavior of variable stars during their faint stages which can only be observed with the largest apertures.
- (3) The adaptation of the Pickering "equalizing wedge photometer" to the determinations of magnitudes.
- (4) The photometric measurement of very faint magnitudes, and their relation to estimates founded on the limit of visibility of different apertures of telescopes.

I wish to acknowledge here the efficient assistance rendered in the reductions by Miss Kate Bloodgood, also by Mr. F. R. Sullivan of the observatory staff, who recorded all the photometric measures made with the 40-inch telescope.

HISTORICAL.

The writer's variable-star work began at Marengo, Illinois, in May, 1893, with visual comparisons by Argelander's method of a list of long-period variables, including at first the circumpolar stars in Professor E. C. Pickering's pamphlet, "*Variable Stars of Long Period*," published in 1891; with additions, from time to time, of new variables which were not receiving sufficient attention elsewhere. By the end of 1899 the number of observations amounted to about 5,000, furnishing data for determining 162 maxima and 116 minima. Provisional results were published in the *Astronomical Journal*, vols. 13 to 21, and in *Popular Astronomy*, vols. 2 to 8. This work was made possible largely by the kind assistance of P. S. Yendell, of Dorchester, Massachusetts, who with great patience gave the instructions needed by a beginner and corrected the errors into which one was so likely to fall; also of Henry M. Parkhurst, of Brooklyn, New York, who, beside

other assistance, made photographic copies of the forty *Durchmusterung* charts, then out of print, making possible the finding of the newer variables and the identification of the brighter comparison stars; and of Prof. E. C. Pickering, who furnished charts and photometric magnitudes of many of the comparison stars.

The instrument used so far was a 6.5-inch reflector by Brashear, but connection with the Yerkes Observatory for three months in 1898 and since January, 1900, has made possible the extension of the work to the determination of the minima of very faint stars, fixing the photometric magnitudes of the stars used for comparison, and making photographic charts of the fields surrounding the variables.

PLAN OF WORK.

Two points were determined from the start: (1) To follow the variables as far as possible throughout their period; (2) to give special attention to the positions and identifications of the comparison stars. To carry out the first point, preference was given to circumpolar stars, which could be followed the year around. To fulfill point 2, the coordinates of the comparison stars from the variable were measured with a filar position micrometer, at first on the 6-inch, afterwards for twenty fields with the 40-inch for the faint stars. The completion of the 24-inch reflector in 1901 made it possible to accomplish this object much easier and better by photography, so beginning in November of that year plates were taken to show the faintest comparison stars used.

The addition of the Pickering equalizing wedge photometer to the outfit in 1900 made it possible to complete the plan of work by adding (3) the determination of the photometric magnitudes of the comparison stars, based on standard stars which had been measured both at Harvard and Potsdam. The publication of the Harvard catalogue and the approaching completion of the Potsdam work, including all stars north of the equator to magnitude 7.5, furnished the basis for this work, but it did more than that; it called for a minute comparison of the two magnitude systems in conditions of practical work. It is not enough to know the average differences between the two systems; the practical question is, What systematic differences will be found in standards selected for a particular field? To anticipate the results discussed in Chapter XIV it may be stated here that the irregularities found in the systematic differences leave an outstanding uncertainty of about 0.1 magnitude in stars as bright as 7.0.

ESSENTIALS FOR GOOD VISUAL COMPARISONS.

Among the precautions kept in mind to insure good visual comparisons, the following were foremost:

(1) The two stars to be compared were made parallel to the line of the eyes. To the writer this precaution was of the utmost importance, for if two equal stars were placed in a vertical line the lower would appear more than half a magnitude the brighter. The required position of the stars was easily secured with the 6-inch reflector by turning the tube in its cradle.

(2) Two or three comparison stars were used at each observation if they could be found in proper distances and magnitudes, though this rule often conflicted with the two following.

- (3) The stars to be compared should be in the same field, and
- (4) The interval in brightness should be less than half a magnitude. If this limit was exceeded the comparisons were weighted in the reductions, inversely as the interval.
- (5) Prejudice which would arise from anticipating the star's expected changes, was avoided by postponing the reductions till the maximum or minimum was completed. The observing list was long enough so that the previous observations were usually forgotten at the time of a comparison.
- (6) The comparison of too bright stars was avoided by reducing the aperture when necessary.
- (7) Light in the eyes was avoided by using for recording a one-candlepower incandescent lamp, so shielded as to illuminate faintly a circle one or two inches in diameter on the record book.

ESSENTIALS FOR GOOD PHOTOMETER MEASURES.

Experience taught the necessity of close adherence to the following principles:

(1) A sky free from clouds and of uniform transparency is the prime requisite. A "patchy" sky is a signal to stop photometric work. All observers agree to this in theory, but their adherence to it is a variable quantity, yet it is doubtless the largest single factor affecting the quality of the work. According to my experience a lack of transparency amounting to a perceptible haziness is liable to introduce a systematic error in the night's measures. This is not the "local" error entering when distant regions, like polar and equatorial, are compared; but it shows in measures of a field limited to one degree in diameter.

(2) Measures of a field should be repeated immediately, in inverse order from the first set, to eliminate progressive changes (*a*) in the transparency of the air and (*b*) in the brightness of the artificial star. Under (*a*), at least in the climate of the northern Middle States, progressive change in the transparency of the air is to be expected from hour to hour, and I suspect that this is true in all except a few favored regions. Admitting this, the duty of repetition in inverse order follows. The neglect of this apparently obvious precaution in most photometric work is difficult to explain or justify.

(3) The real and artificial stars should resemble each other closely. This was possible in the present work with the 6- and 12-inch telescopes, the stars being usually indistinguishable, but it was not always possible with the 40-inch.

(4) The stars to be compared should be in a uniform relative position. The practice of the writer has been to place them in a horizontal line, with the real star to the left of the artificial, and distant about 0.4 the space between the two images of the artificial star. Following the principle mentioned under (1) in "Visual comparisons" this uniform position seemed preferable to the four recommended by Professor Ceraski.

(5) Nothing but the photometer lamp should be in the circuit from the storage cell supplying the current, and there should be no sliding contacts in the circuit; all should be soldered or screwed. The lamp should burn very nearly at its specified candlepower.

(6) At least three standard stars should be used in each series; the measures of a field should be made on at least three nights; three settings of the photometer on each star (repeated as specified under (2), making six settings in all). Experience convinced the writer that three settings were as good as four, with the added advantage that three could be kept in mind and recorded at once.

(7) The use of too dark a shade glass (see Chapter I) should be avoided, a change as great as two magnitudes in the background had an injurious effect on the measures.

Table 1 gives the selected list of variable stars in whose fields the investigations were conducted, with a summary from the following chapters of the periods determined and the magnitudes at maxima and minima. The positions given were (with the single exception of RU Herculis) measured with the filar micrometers on the 6- and 40-inch telescopes.

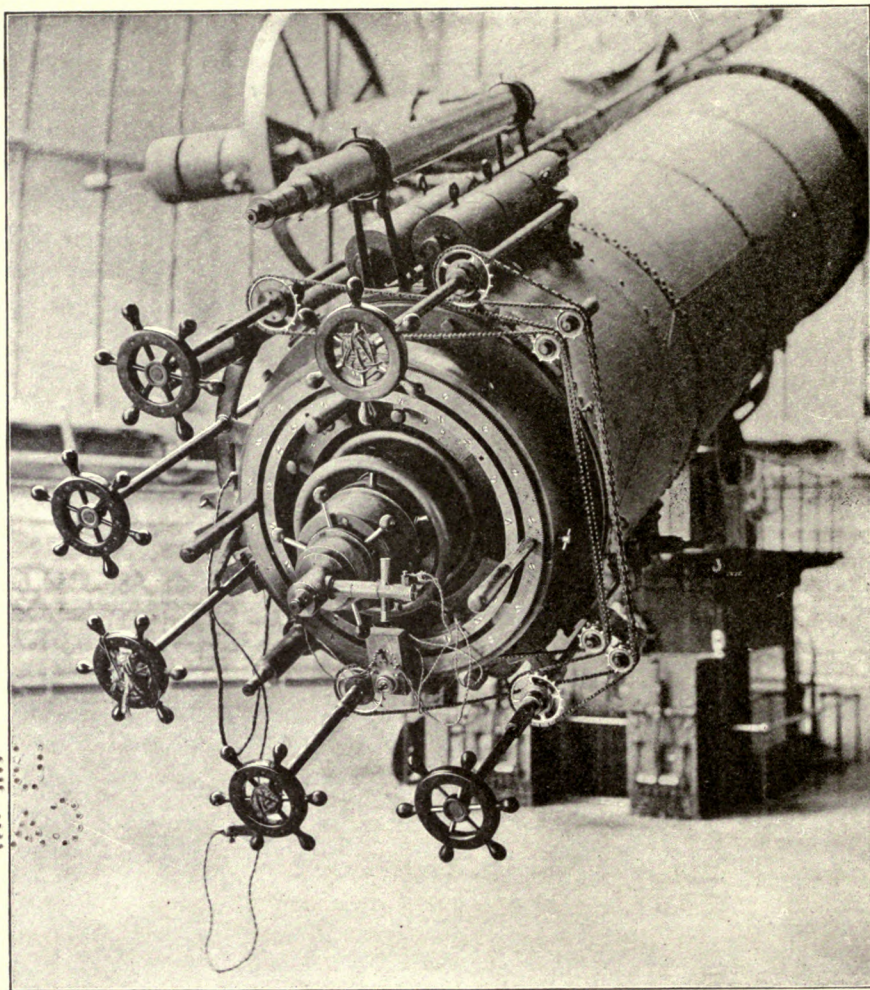
Table 2 summarizes the visual observations of the variables, giving the number, limiting dates, and resulting number of maxima and minima.

TABLE 1.—LIST OF VARIABLE STARS.

| Star. | 1900. | | | Period. | M-m. | Range. | | | | | | |
|-------|-----------------|-----------------|----------|---------|------|--------------|------|------|----------|----------|----------|----------|
| | RightAscension. | | | | | Declination. | Max. | Min. | | | | |
| | <i>h</i> | <i>m</i> | <i>s</i> | | | | | | <i>°</i> | <i>'</i> | <i>"</i> | <i>d</i> | d | Mag. | Mag. |
| 103 | T | Andromedæ..... | 0 | 17 | 10.0 | + 26 | 26 | 27 | 284 | 126 | 8.5 | 13.0 |
| 267 | V | Andromedæ..... | 0 | 44 | 39.7 | + 35 | 6 | 30 | 259 | 111 | 9.0 | 14.0 |
| 787 | W | Andromedæ..... | 2 | 11 | 14.1 | + 43 | 50 | 26 | 396 | 192 | 7.5 | 13.8 |
| 4315 | R | Comæ..... | 11 | 59 | 8.4 | + 19 | 20 | 19 | 361.8 | 119 | 8.5 | 14.0 |
| 5798 | RU | Herculis..... | 16 | 6 | 2.7 | + 25 | 19 | 56 | 484 | 217 | 7.5 | 14.0 |
| 6100 | RV | Herculis..... | 16 | 56 | 44.7 | + 31 | 22 | 18 | 200 | 81 | 9.7 | 15.3 |
| 6894 | S | Lyræ..... | 19 | 9 | 6.3 | + 25 | 50 | 17 | 438 | 154 | 10.0 | 15.0 |
| 7220 | S | Cygni..... | 20 | 3 | 24.7 | + 57 | 41 | 52 | 326 | 162 | 10.0 | 16.7 |
| 7269 | SX | Cygni..... | 20 | 11 | 33.2 | + 30 | 45 | 58 | 409 | 173 | 9.0 | 14.0 |
| 7458 | V | Delphini..... | 20 | 43 | 13.6 | + 18 | 58 | 1 | 529 | 161 | 8 | 17 |
| 8518 | Z | Cassiopeiæ..... | 23 | 39 | 39.9 | + 56 | 1 | 33 | 492 | 173 | 10.2 | 15.2 |
| 8629 | Y | Cassiopeiæ..... | 23 | 58 | 13.8 | + 55 | 7 | 25 | 410 | 158 | 9.1 | 14.0 |

TABLE 2.—SUMMARY OF VISUAL OBSERVATIONS OF THE VARIABLES.

| Star. | Number of observations. | Began— | Ended— | Number of— | |
|------------------------|-------------------------|-----------|-----------|------------|------|
| | | | | Max. | Min. |
| 103 T Andromedæ..... | 173 | 1894 Mar. | 1905 Nov. | 11 | 12 |
| 267 V Andromedæ..... | 109 | 1897 Jan. | 1905 Dec. | 10 | 10 |
| 787 W Andromedæ..... | 75 | 1899 Feb. | 1905 Dec. | 6 | 6 |
| 4315 R Comæ..... | 132 | 1894 Mar. | 1905 Aug. | 8 | 10 |
| 5798 RU Herculis..... | 136 | 1897 Jan. | 1905 Oct. | 6 | 6 |
| 6100 RV Herculis..... | 55 | 1897 Aug. | 1905 Nov. | 14 | 13 |
| 6894 S Lyræ..... | 110 | 1896 Oct. | 1905 Nov. | 8 | 6 |
| 7220 S Cygni..... | 100 | 1892 Dec. | 1905 Dec. | 9 | 8 |
| 7269 SX Cygni..... | 75 | 1899 Oct. | 1905 Nov. | 5 | 5 |
| 7458 V Delphini..... | 140 | 1894 June | 1905 Dec. | 7 | 6 |
| 8518 Z Cassiopeïæ..... | 100 | 1898 Nov. | 1905 Nov. | 4 | 4 |
| 8629 Y Cassiopeïæ..... | 100 | 1898 Feb. | 1905 Nov. | 7 | 7 |
| Total..... | 1,405 | ..... | ..... | 95 | 93 |



EQUALIZING WEDGE PHOTOMETER ON 40-INCH TELESCOPE.

CHAPTER I.

INSTRUMENTS.

The visual and photometric work was done with three different telescopes, of 6, 12 and 40 inches aperture, thus making it possible to follow the variable stars throughout their cycles, and to measure the magnitudes of all the comparison stars needed. The lack of homogeneity in the visual comparisons, resulting from the use of such different apertures, could not be avoided, but its harmful effect was kept within limits by the use of the photometric magnitudes of the comparison stars.

The 6-inch reflecting telescope, made by Brashear, is provided with driving clock, circles (the hour circle movable), and rotating tube, making zenith observations comfortable, also making it possible to bring the line of the two stars compared parallel with the line of the eyes, a matter of prime importance in visual work. Standard stars from the Harvard and Potsdam catalogues, chosen between the 6th and 8th magnitudes, could be matched in brightness by the artificial star of the photometer. If brighter than the 7th magnitude the shade glass was used, its cell being hinged so that it could be turned into the cone of rays between the ocular and the flat. The visual limit of the 6-inch with a power of 150 is about 13.0 (see p. 10), but with the power of 40 used with the photometer it was not possible to make accurate measures of stars fainter than 11.0, while in practice the stars measured were between 8 and 10.

The 12-inch Brashear refractor and the 40-inch Clark refractor of the Yerkes Observatory need no special description. Their visual limits are about 14.5 and 17.0 magnitude, respectively. In the photometric work the greatest accuracy is secured by connecting with the 12-inch, standards between 8th and 9th magnitude with measured stars of about the 12th magnitude, then with the 40-inch to pass from the 12th magnitude to the faintest stars possible, about the 16th magnitude.

THE EQUALIZING WEDGE PHOTOMETER AND THE DETERMINATION OF THE ABSORPTION OF ITS WEDGE.

In pursuance of a plan for cooperation in determining standards for faint stellar magnitude, Prof. E. C. Pickering sent to the Yerkes Observatory in April, 1900, one of the five wedge photometers which he had devised for the work. This was to be used with the 40-inch refractor in the measurement of the faintest stars included in the plan. The construction of the instrument is shown in fig. 1 and Plate 1. The tube *T*, carrying the ocular *O*, slides into the tailpiece of the telescope. At right angles to this is the tube *C*, carrying the essential parts of the photometer. The light from a one-candlepower incandescent lamp *L* shines through a minute hole in the diaphragm *D* upon a piece of ground glass *G*, forming

an artificial star. In contact with *G* is a piece of blue glass to render the light of the star less yellow. An image of this star is thrown by the projecting lens *P* upon a plate of plane-parallel glass *B* and reflected from both surfaces into the focus of the ocular *O*, forming at *E* and *F* two images of the artificial star. Interposed in the path of these rays is the photographic wedge *W*, movable at right angles to *C* by the rack and pinion *R*. The short tube carrying the ground glass *G* is movable away from the diaphragm *D* by means of the head of the screw *S*, projecting through an inclined slot in the farther side of the tube *C*. By this means the artificial star can be made larger and less sharply defined, thus resembling more closely a real star under different atmospheric conditions. Finally, a pair of shade glasses at *A* can be moved, either both or singly, into the path of the rays.

In photometers made on this principle the all-important condition to be fulfilled is that the images of the real and artificial stars should closely resemble each other. The range of adjustment of the ground glass *G* was found to be insufficient to meet this condition with the different telescopes on which the photometer was to be used; therefore the diaphragm *D*, originally provided, which had a single aperture 0.17 mm. in diameter was replaced with a movable

diaphragm carrying four apertures, 0.10, 0.15, 0.20, and 0.25 mm. in diameter. By choosing the most suitable aperture and combining with it a slight movement of the ground glass, it was possible to give the disk of the artifi-

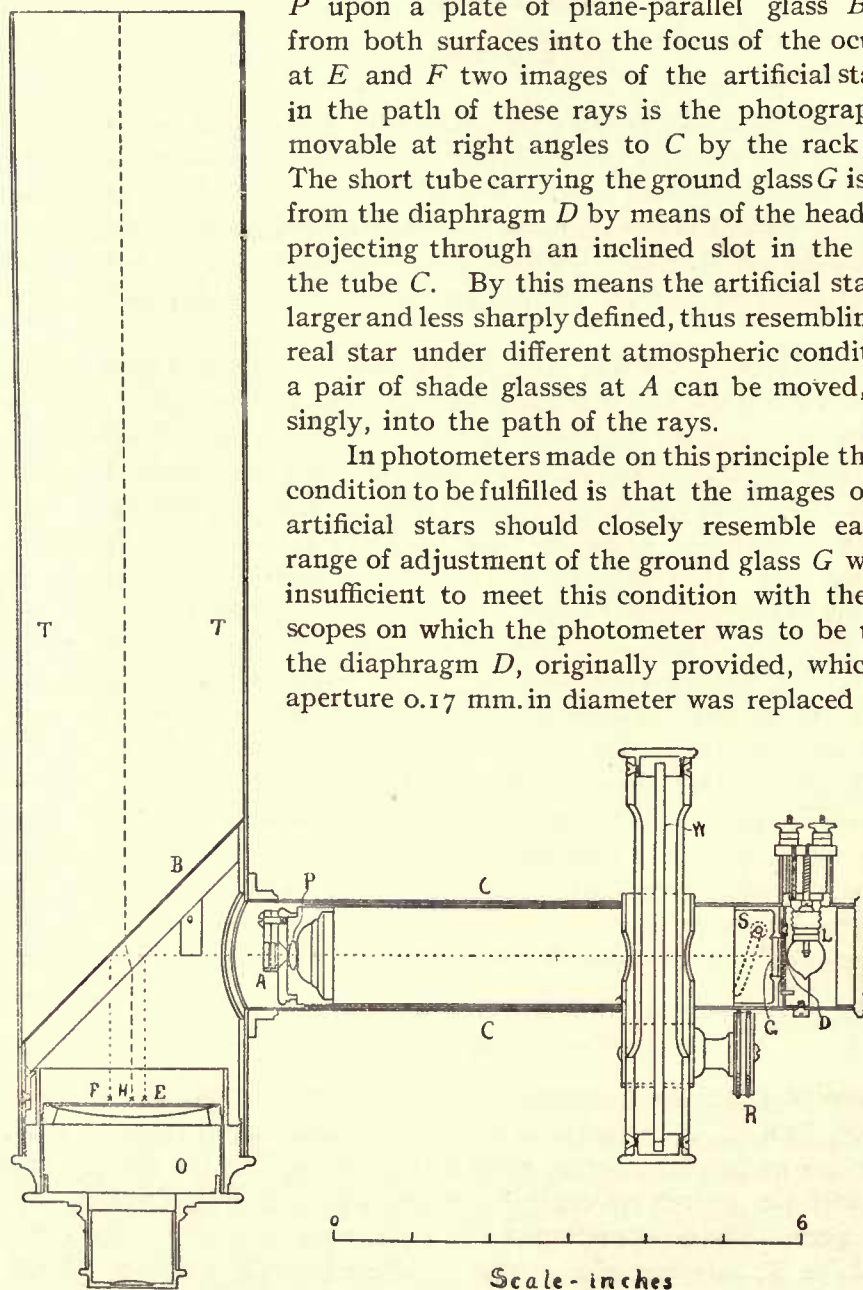


FIG. 1.—SECTION OF PHOTOMETER.

cial star any required size and sharpness to suit the various telescopes used and the different atmospheric conditions. With few exceptions the hole 0.15 was used with the 6- and 12-inch and 0.20 with the 40-inch.

In order to use the photometer with a 6.5-inch reflector, a smaller tube was provided carrying an ocular and a diagonal reflecting plate to replace *B*. After several trials good images of the real and artificial stars were given by a diagonal plate with surfaces correct to one-tenth of a wave-length, furnished by Mr. O. L. Petitdidier, of Chicago.

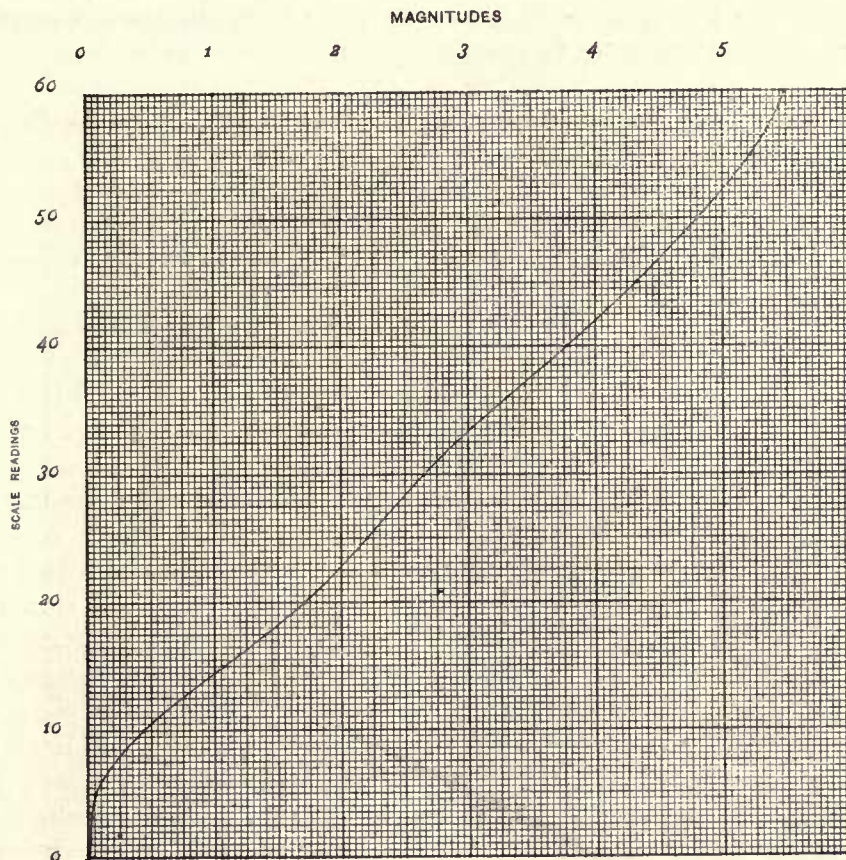


FIG. 2.—CURVE A 12. ABSORPTION OF WEDGE V ON 12- AND 40-INCH REFRACTORS.

The use of the instrument is very simple and convenient. The image of the star to be measured (shown at *H* in the drawing) is brought between the two images of the artificial star, and the wedge is moved by the pinion *R* till the light of the real star is matched by *E*, the image formed by reflection from the first surface of the plate *B*. The position of the wedge is then read on a scale divided to twenty-fifths of an inch, tenths of a division being estimated. If now the light of a star of known magnitude be measured, the only unknown quantity is the absorption of the wedge, expressed in magnitudes.

The methods available for determining the wedge absorption can be classed under two heads: (1) Measurements of standard stars whose magnitudes have been well fixed; (2) measurements of an artificial star whose light can be reduced by a known amount either by (a) polarization, (b) a revolving wheel, (c) reduced apertures by stationary diaphragms. The last method can be used either with real or artificial stars. The method by standard stars seems to give the best results, as it has the great advantage that the measurements are made under the same conditions as exist in practice.

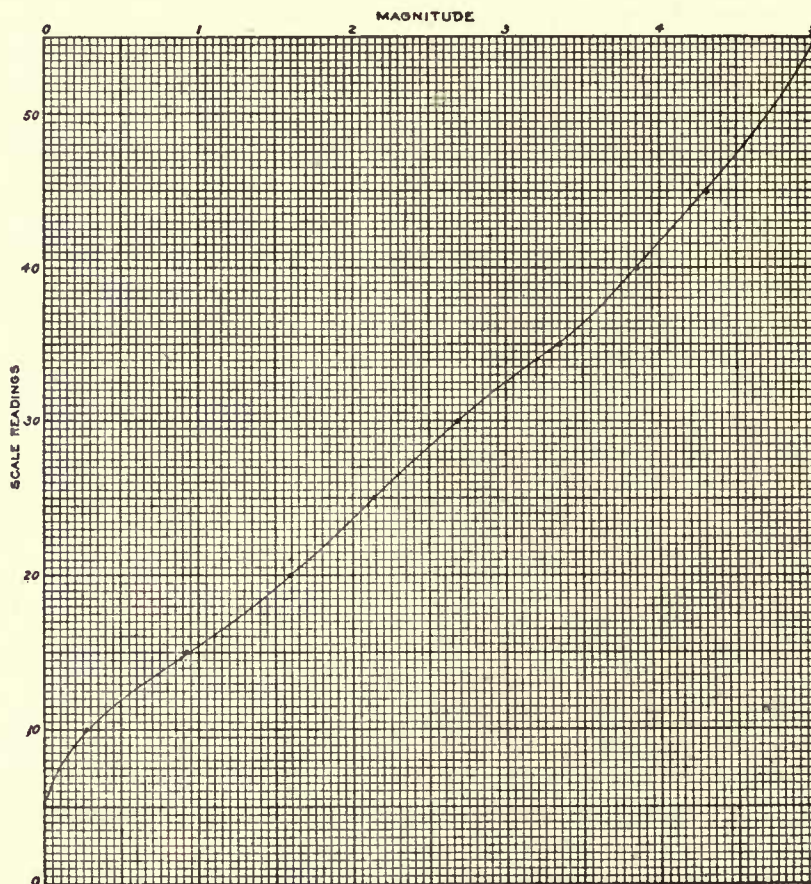


FIG. 3.—CURVE E 6. ABSORPTION OF WEDGE V ON 6-INCH REFLECTOR.

The errors which may be introduced by the neglect of this precaution are dealt with by King in *Harvard Annals*, 41, pages 237 *et seq.*, where it was found that the mean absorption corresponding to one scale division was 0.090 with the wedge almost in contact with the aperture, and 0.130 with the wedge 5 cm. from the aperture. Again, it was found by Aitken and Maddrill (*Astrophysical Journal*, 22, 147) that the absorption measured with a Lummer-Brodhun photometer, comparing surfaces, must be increased by one-quarter to equal the results obtained from stand-

ard stars. To avoid these sources of error, wedge V, which was used in nearly all the measures here considered, was calibrated by the three following methods, in all of which the wedge was placed *in situ*, and the conditions in actual practice quite exactly used¹:

- (1) Standard Pleiades stars, 2,700 settings.
- (2) Comparison with Zöllner photometer, 3,000 settings.
- (3) Comparison with "wheel" photometer, 500 settings.

Full details of this calibration will be published in connection with the work on "Determination of Standards for Faint Stellar Magnitude;" but in this connection a comparison of the results by the three methods will give the quantities used in the reductions and at the same time enable the reader to form an opinion of the degree of accuracy attained.

(1) The standard Pleiades stars were measured with both the 6- and 12-inch telescopes, and the platted measures give the absorption in the second column of Table 3.

(2) The Zöllner polarizing photometer was set up in a dark room opposite the wedge photometer, and the artificial stars compared, first by projecting the Zöllner star into the wedge, second by projecting the wedge star into the Zöllner. The mean of these closely accordant results gives the absorptions in the third column of Table 3.

(3) The wedge star was compared with an artificial star cut down by a revolving wheel provided with sectors, giving the quantities in the fourth column.

The weighted mean of these three determinations gives the values in column five, which are points in the absorption curve corresponding to the scale readings in the first column. This curve is called A 12, and is used in the reductions of the 12- and 40-inch measures.

Since another ocular and diagonal plate was used in the 6-inch measures, and the appearance of the star images, both real and artificial, was different, it was not considered allowable to assume that the absorption curve would be the same; therefore the measures of the Pleiades stars were repeated with the 6-inch and the comparison with the Zöllner photometer was made with the same arrangement of apparatus as used on the 6-inch. The absorption curve found, called E 6, is shown by column six to differ enough from A 12 to justify the separate investigation, and at the same time to confirm the general features of the curve A 12.

A few measures of faint stars were made in 1900 with wedge II, whose absorption curve derived from standard stars and the "wheel," is given by points in the last column of the table.

The question of the trustworthiness of the adopted absorption curve is of the highest importance in this work, and demands the most rigid scrutiny. The

¹ A fourth comparison with another polarizing photometer has since given identically the same absorption curve.

evidence in Table 3 may be summed up as follows: (1) The results by two independent methods, standard stars and laboratory measures, are in good agreement, the average probable error of the points platted on curve A 12 being less than ± 0.03 , with a maximum of ± 0.07 . (2) The laboratory measures were all made by matching artificial stars which closely resembled the real stars.

TABLE 3.—ABSORPTION OF WEDGES II AND V.

| Scale. | Wedge V. | | | | | Wedge II. |
|--------|-----------|----------|--------|--------|---------|-----------|
| | 12-inch. | | | | 6-inch. | II c. |
| | Pleiades. | Zöllner. | Wheel. | A 12. | E 6. | |
| 60 | (5.80) | .... | .... | (5.49) | .... | .... |
| 55 | 5.34 | 5.12 | .... | 5.22 | .... | 5.32 |
| 50 | 4.85 | 4.76 | .... | 4.80 | 4.70 | 4.99 |
| 45 | 4.39 | 4.28 | 4.28 | 4.33 | 4.41 | 4.51 |
| 40 | 3.80 | 3.77 | 3.77 | 3.78 | 3.85 | 3.93 |
| 35 | 3.14 | 3.27 | 3.20 | 3.19 | 3.30 | 3.35 |
| 30 | 2.60 | 2.74 | 2.61 | 2.65 | 2.68 | 2.85 |
| 25 | 2.15 | 2.27 | (2.18) | 2.20 | 2.13 | 2.27 |
| 20 | 1.65 | 1.80 | (1.74) | 1.72 | 1.59 | 1.51 |
| 15 | 1.07 | 1.08 | 1.07 | 1.06 | 0.93 | 0.72 |
| 10 | 0.46 | 0.42 | 0.50 | 0.43 | 0.28 | 0.11 |
| 5 | .... | 0.06 | .... | 0.05 | (0.00) | .... |
| 0 | .... | 0.02 | .... | (0.01) | .... | .... |

A check on the mean value of the absorption is furnished by the measured magnitudes of the stars near the limit of vision of the 6-inch telescope. Table 4 gives the field, the estimate of the limit of vision, the photometric magnitude of the limit, the correction for atmospheric extinction, and the final corrected magnitude of the limit, expressed in both the Harvard and Potsdam systems.

TABLE 4.

| Field. | Limit. | Mag. | | Corr. | Corr. Mag. | |
|-------------------|--------|-------|-------|-------|------------|-------|
| | | H. | P. | | H. | P. |
| Z Cassiopeia..... | k | 12.99 | 12.88 | 0.04 | 13.03 | 12.92 |
| W Lyra..... | 2-3<1 | 12.60 | 12.93 | 0.00 | 12.60 | 12.93 |
| S Lyra..... | z | 12.82 | 13.24 | 0.00 | 12.82 | 13.24 |
| SX Cygni..... | 3<n | 12.34 | 12.69 | 0.00 | 12.34 | 12.69 |
| RU Hercules..... | 2<n | 13.05 | 13.32 | 0.02 | 13.07 | 13.34 |
| V Cassiopeia..... | q | 12.61 | 12.94 | 0.03 | 12.64 | 12.97 |
| Mean..... | ..... | ..... | ..... | ..... | 12.75 | 13.01 |

CHAPTER II.

103 T ANDROMEDÆ.

R. A. 0h 17^m 10.0^s; Dec. +26° 26' 27" (1900).

The variability of this star was discovered by Anderson in 1893 and observations began soon after the receipt of the *Astronomische Nachrichten* No. 3202 containing the announcement. The literature concerning the star is given so completely in the forthcoming catalogue of the Gesellschaft committee, that it is unnecessary to repeat it here. The light changes are unusually regular, the maxima and minima being both well defined. At present the period seems to be lengthening.

The comparison stars have been measured with the photometer, the residuals being: For the catalogue stars, ± 0.03 ; for the stars measured with the 6-, 12-, and 40-inch, respectively, ± 0.08 , ± 0.09 , and ± 0.11 magnitude.

Detailed explanations follow for the tables and figures giving the photometric and visual results for this star. For the other eleven variable stars given in Chapters III to XIII explanations are only given for the few particulars in which the tables differ from those for T Andromedæ. The arrangement of the tables is as follows: First, the data for the identification of the comparison stars with a summary of the magnitude results used in the reductions, Tables 5, 6, and 7; second, the photometric measures in detail, Table 8; third, reduction constants and summary of photometric results, Tables 9 and 10; fourth, visual observations of the variable, with reductions to photometric magnitude, and residuals from the mean light-curve, Table 11; fifth, data for formation of mean light-curve, with residuals for the twelve parts of each separate curve, Table 12; sixth, observed maxima and minima, Table 13.

TABLE 5.—STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|----------|--------------|--------------|-----------|-----------------|------------|--------|-----------|------|------------|-----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H. C. O. | P. DM. | H. | P. | H. | P. | |
| | ° | <i>h m s</i> | ° ' | | | | | | | | |
| <i>A</i> | +25 34 | 0 14 10 | +25 54.7 | GW+ | 7.67 | 7.76 | 7.61 | 7.69 | − 6 | − 7 | ± 4 |
| <i>B</i> | +25 29 | 0 13 18 | +25 36.1 | W+ | 7.21 | 7.42 | 7.47 | 7.55 | +26 | +13 | ± 2 |
| <i>a</i> | +26 40 | 0 16 18 | +26 23.7 | WG+ | 8.20 | 8.12 | 7.98 | 8.06 | −22 | − 6 | ± 3 |
| | Mean | | | | 7.69 | 7.77 | 7.69 | 7.77 | ±18 | ± 9 | ± 3 |

Table 5 gives, for the standard magnitude stars, the Bonn *Durchmusterung* numbers, the position for 1900, the Potsdam color, and the catalogue magnitudes

which form the basis of the photometric work. The "H. C. O." values are taken from the Harvard Annals, 45, the "P. DM." from Potsdam Publications, vols. 9, 13 and 14. Then follow the measured magnitudes and residuals which result from Table 10, and will be considered in that connection. As all the measured magnitudes are based on these three catalogue stars it follows that the measured magnitude of each star expressed in the Potsdam system will be 0.08 greater numerically than its magnitude in the Harvard system.

TABLE 6.—COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|--------|------|--------------|----------|----------|--------|------|--------------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | ° | | <i>h m s</i> | ° ' " | | ° | | <i>h m s</i> | ° ' " |
| <i>d</i> | +26 37 | 8.8 | 0 13 33 | +26 10.0 | <i>e</i> | +26 46 | 9.4 | 0 15 47 | +26 22.9 |
| <i>a</i> | +26 40 | 7.5 | 0 13 58 | +26 8.7 | <i>c</i> | +26 47 | 9.1 | 0 15 50 | +26 18.4 |
| <i>l</i> | +25 40 | 9.5 | 0 14 19 | +25 58.3 | <i>f</i> | +26 48 | 9.4 | 0 16 10 | +26 12.1 |
| <i>b</i> | +26 42 | 8.1 | 0 14 27 | +26 23.4 | | | | | |

Table 6. As a few of the brighter comparison stars are not within the limits of the photographic charts, Table 6 gives the B. D. numbers, magnitudes, and places for 1855 of the stars in that catalogue not in Table 5.

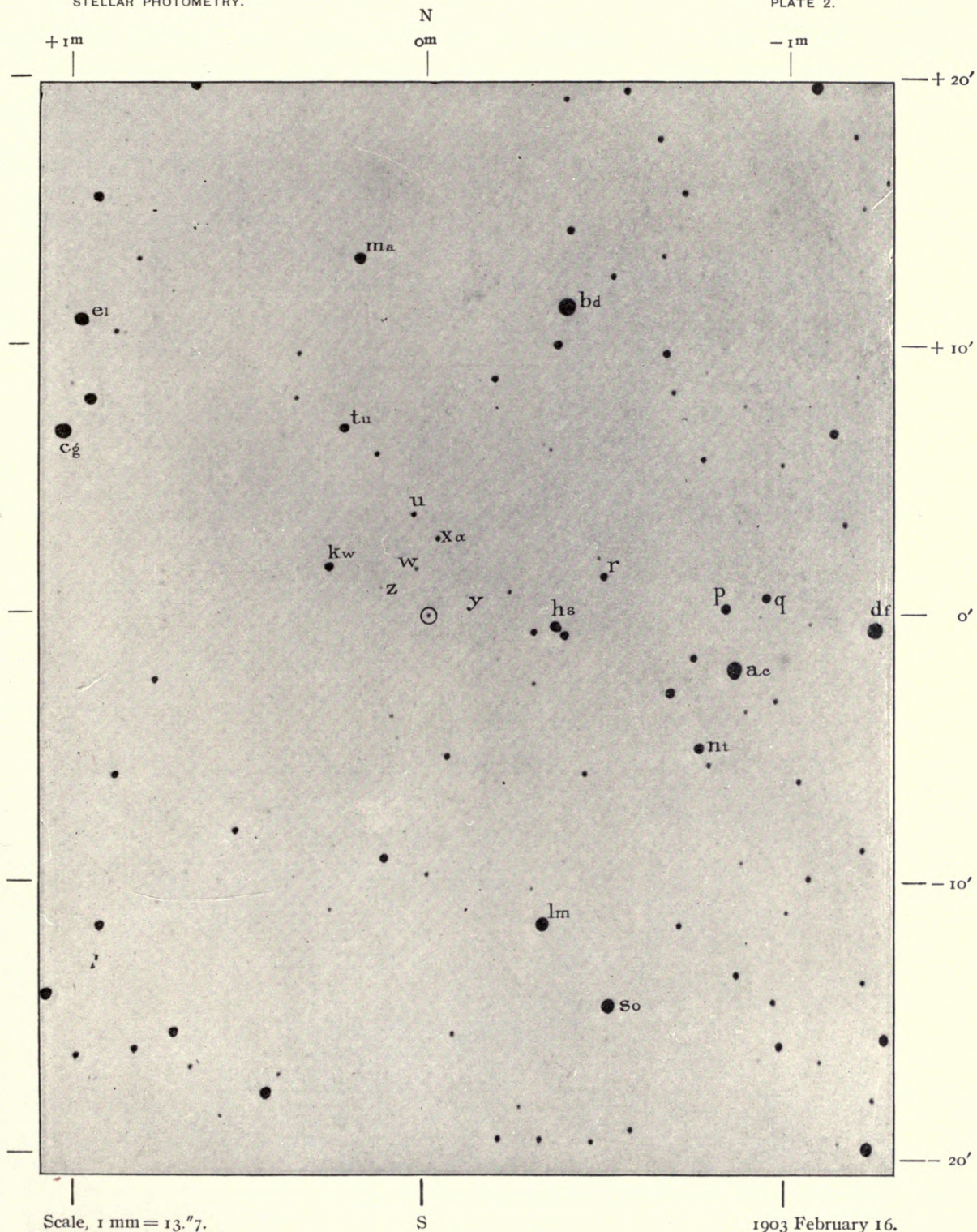
TABLE 7.—COMPARISON STARS FOR T ANDROMEDÆ (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|----------|----------------------------|----------|------|---------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | H. | P. | H. | P. | H. | P. | H. | P. |
| | " | <i>s</i> | " | | | | | |
| <i>d</i> | -1017 | -74.0 | -30 | 34.7 | 9.12 | 9.20 | ..... | ..... |
| <i>q</i> | -770 | -56.1 | +41 | 14.3 | ..... | ..... | 12.2 | 12.3 |
| <i>a</i> | -698 | -50.8 | -122 | 42.0 | 7.98 | 8.06 | ..... | ..... |
| <i>p</i> | -679 | -49.4 | +19 | 15.3 | ..... | ..... | 12.1 | 12.2 |
| <i>n</i> | -617 | -44.9 | -297 | 17.1 | ..... | ..... | 11.8 | 11.9 |
| <i>o</i> | -550 | -40.0 | -173 | 16.3 | ..... | ..... | 11.9 | 12.0 |
| <i>s</i> | -411 | -29.9 | -873 | 25.6 | 10.32 | 10.40 | ..... | ..... |
| <i>r</i> | -389 | -28.3 | +85 | 10.3 | ..... | ..... | 12.8 | 12.9 |
| <i>b</i> | -316 | -23.0 | +690 | 39.0 | 8.72 | 8.80 | ..... | ..... |
| <i>h</i> | -290 | -21.1 | -23 | 18.9 | ..... | ..... | 11.54 | 11.62 |
| <i>l</i> | -259 | -18.9 | -690 | 26.5 | 10.15 | 10.23 | ..... | ..... |
| <i>y</i> | -85 | -6.2 | +44 | ..... | 14.40 | 14.48 | ..... | ..... |
| <i>x</i> | -21 | -1.5 | +174 | 10.0 | 13.12 | 13.20 | ..... | ..... |
| <i>w</i> | +30 | +2.2 | +103 | ..... | 13.68 | 13.76 | ..... | ..... |
| <i>u</i> | +33 | +2.4 | +226 | ..... | 13.22 | 13.30 | ..... | ..... |
| <i>z</i> | +108 | +7.9 | +62 | ..... | 14.08 | 14.16 | ..... | ..... |
| <i>m</i> | +157 | +11.4 | +800 | 20.5 | ..... | ..... | 11.28 | 11.36 |
| <i>t</i> | +196 | +14.3 | +420 | 12.3 | 11.66 | 11.74 | ..... | ..... |
| <i>k</i> | +227 | +16.5 | +106 | 14.3 | 11.85 | 11.93 | ..... | ..... |
| <i>e</i> | +793 | +57.7 | +659 | 30.7 | 10.20 | 10.28 | ..... | ..... |
| <i>c</i> | +835 | +60.8 | +394 | 33.6 | 9.51 | 9.59 | ..... | ..... |
| <i>f</i> | +1125 | +81.9 | +118 | 29.5 | ..... | ..... | 9.97 | 10.05 |

Table 7 collects the data for position and magnitude of all the comparison stars used. The second and fourth columns give the rectangular coordinates from the variable in seconds of arc; the third column expresses the R. A. coordinate

STELLAR PHOTOMETRY.

PLATE 2.



103 T ANDROMEDÆ.

R. A. $0^h 17^m 10^s.0$. Dec. $+26^\circ 26' 27''$, 1900.

in seconds of time. The fifth column gives the brightness of the star in steps of the light-scale, which result from the observations in Table 11, and will be explained in that connection. The last four columns give the magnitude, either "measured" with the photometer or read from the magnitude-curve (fig. 4). In each case the heading "H." indicates the Harvard, and "P." the Potsdam system.¹ The adopted values for stars measured with both 6- and 12-inch are taken from the 12-inch.

TABLE 8.—103 T ANDROMEDÆ.
PHOTOMETER MEASURES OF COMPARISON STARS.
6-INCH.

| 1904 October 15. | | | | Fair to good, quiet, a little dull. | | | | | |
|------------------|------------|----------|-----------------|-------------------------------------|------------|-------|------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | <i>°</i> | | | | | | | | |
| 1 01 | 20 | <i>c</i> | 26.7 27.3 27.1 | 27.03 | 27.62 | 2.41 | 9.22 | 9.30 | |
| | | <i>e</i> | 38.8 39.0 38.1 | 38.63 | 37.65 | 3.62 | 10.43 | 10.51 | |
| | | <i>b</i> | 22.6 24.2 23.0 | 23.27 | 24.42 | 2.07 | 8.88 | 8.96 | |
| | | <i>d</i> | 24.2 26.2 26.3 | 25.57 | 25.89 | 2.23 | 9.04 | 9.12 | |
| | | <i>a</i> | 15.7 16.3 16.4 | 16.13 | 16.55 | 1.16 | 7.97 | 8.05 | |
| | | <i>l</i> | 34.8 35.2 36.0 | 35.33 | 35.72 | 3.42 | 10.23 | 10.31 | |
| | | <i>s</i> | 36.8 36.7 36.3 | 36.60 | ..... | 3.52 | 10.33 | 10.41 | |
| | | <i>A</i> | 13.8 14.0 13.9 | 13.90 | 14.30 | 0.84 | 7.65 | 7.73 | |
| | | <i>B</i> | 13.1 12.2 13.2 | 12.83 | 12.98 | 0.63 | 7.44 | 7.52 | |
| | | <i>B</i> | 12.9 13.7 12.8 | 13.13 | ..... | ..... | ..... | ..... |  |
| | | <i>A</i> | 15.1 14.0 14.0 | 14.70 | ..... | ..... | ..... | ..... |  |
| | | <i>l</i> | 36.1 35.9 36.3 | 36.10 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 16.5 17.2 17.2 | 16.97 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 25.3 26.4 26.9 | 26.20 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 25.8 25.8 25.1 | 25.57 | ..... | ..... | ..... | ..... |  |
| | | <i>e</i> | 36.1 37.2 36.7 | 36.67 | ..... | ..... | ..... | ..... |  |
| 1 24 | 22 | <i>c</i> | 28.3 27.8 28.5 | 28.20 | ..... | ..... | ..... | ..... |  |

| 1904 October 27. | | | | Fine, moon rising at end. | | | | | |
|------------------|----|----------|----------------|---------------------------|-------|-------|-------|-------|--|
| 21 36 | 37 | <i>B</i> | 9.7 10.1 9.5 | 9.77 | 10.17 | 0.30 | 7.49 | 7.57 | |
| | | | | | | | | | |
| | | <i>A</i> | 11.7 11.9 11.8 | 11.80 | 11.44 | 0.44 | 7.63 | 7.71 | |
| | | <i>s</i> | 32.0 31.9 31.8 | 31.90 | ..... | 2.92 | 10.11 | 10.19 | |
| | | <i>l</i> | 32.8 33.4 33.4 | 33.20 | 32.99 | 3.05 | 10.24 | 10.32 | |
| | | <i>a</i> | 13.0 14.7 14.2 | 13.97 | 13.84 | 0.76 | 7.95 | 8.03 | |
| | | <i>d</i> | 25.1 25.8 25.0 | 25.30 | 24.49 | 2.08 | 9.27 | 9.35 | |
| | | <i>b</i> | 21.0 21.2 21.4 | 21.20 | 20.57 | 1.66 | 8.85 | 8.93 | |
| | | <i>e</i> | 30.9 31.3 32.1 | 31.43 | 31.72 | 2.89 | 10.08 | 10.16 | |
| | | <i>c</i> | 24.0 25.2 25.0 | 24.73 | 25.15 | 2.15 | 9.34 | 9.42 | |
| | | <i>c</i> | 25.5 25.9 25.3 | 25.57 | ..... | ..... | ..... | ..... |  |
| | | <i>e</i> | 32.5 31.6 31.9 | 32.00 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 19.4 20.6 19.8 | 19.93 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 23.2 23.3 24.5 | 23.67 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 14.2 13.6 13.3 | 13.70 | ..... | ..... | ..... | ..... |  |
| | | <i>l</i> | 32.0 33.3 33.0 | 32.77 | ..... | ..... | ..... | ..... |  |
| | | <i>A</i> | 11.2 10.9 11.1 | 11.07 | ..... | ..... | ..... | ..... |  |
| 21 57 | 34 | <i>B</i> | 9.8 11.2 10.7 | 10.57 | ..... | ..... | ..... | ..... |  |

¹The letters "H. C. O." and "P. DM" indicate that the magnitudes are taken directly from the respective catalogues. The letters "H." and "P." indicate measurements by the writer, expressed in the corresponding systems.

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TABLE 8.—103 T ANDROMEDÆ—Continued.

| 1904 October 30. | | | | | | | Good. | | |
|--------------------|------------|-----------------------|-----------------|----------------------|------------|-------|------------|-------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | <i>°</i> | | | | | | | | |
| 21 00 | 44 | <i>B</i> | 11.7 11.4 11.6 | 11.57 | 10.82 | 0.37 | 7.49 | 7.57 | |
| | | <i>A</i> | 11.0 11.6 11.1 | 11.23 | 11.37 | 0.43 | 7.55 | 7.63 | |
| | | <i>s</i> | 35.0 36.0 35.3 | 35.43 | ..... | 3.39 | 10.51 | 10.59 | |
| | | <i>l</i> | 32.9 33.8 33.1 | 33.27 | 33.15 | 3.07 | 10.19 | 10.27 | |
| | | <i>a</i> | 14.7 14.6 14.5 | 14.60 | 14.75 | 0.90 | 8.02 | 8.10 | |
| | | <i>d</i> | 25.8 25.8 25.1 | 25.57 | 25.95 | 2.24 | 9.36 | 9.44 | |
| | | <i>b</i> | 18.8 19.2 19.0 | 19.00 | 20.05 | 1.59 | 8.71 | 8.79 | |
| | | <i>e</i> | 34.0 34.0 34.1 | 34.03 | 33.62 | 3.13 | 10.25 | 10.33 | |
| | | <i>c</i> | 26.5 26.2 27.1 | 26.60 | 26.64 | 2.30 | 9.42 | 9.50 | |
| | | <i>c</i> | 26.8 26.3 26.9 | 26.67 | ..... | ..... | ..... | ..... |  |
| | | <i>e</i> | 33.0 33.3 33.3 | 33.20 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 21.3 20.7 21.3 | 21.10 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 26.0 26.7 26.0 | 26.23 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 14.9 15.4 14.4 | 14.90 | ..... | ..... | ..... | ..... |  |
| | | <i>l</i> | 33.1 33.0 33.0 | 33.03 | ..... | ..... | ..... | ..... |  |
| 21 24 | 40 | <i>A</i> | 11.6 11.8 11.1 | 11.50 | ..... | ..... | ..... | ..... |  |
| | | <i>B</i> | 9.8 10.2 10.2 | 10.07 | ..... | ..... | ..... | ..... |  |
| 1904 September 11. | | | | | | | 12-INCH. | | Good. |
| 20 23 | 49 | <i>d</i> | 15.1 14.8 16.0 | 15.30 | 15.14 | 1.07 | 9.06 | 9.14 | |
| | | <i>b</i> | 11.9 12.3 12.4 | 12.20 | 11.87 | 0.88 | 8.87 | 8.95 | |
| | | <i>e</i> | 23.5 24.8 23.9 | 24.03 | 24.72 | 2.17 | 10.16 | 10.24 | |
| | | <i>c</i> | 17.3 18.0 17.5 | 17.60 | 17.90 | 1.43 | 9.42 | 9.50 | |
| | | <i>t</i> | 39.7 39.9 40.0 | 39.87 | 39.99 | 3.78 | 11.77 | 11.85 | |
| | | <i>k</i> | 39.2 40.7 39.9 | 39.93 | 40.50 | 3.85 | 11.84 | 11.92 | |
| | | <i>x</i> | 53.8 54.7 54.3 | 54.27 | 54.32 | 5.17 | 13.16 | 13.24 | |
| | | <i>l</i> | 22.9 23.1 23.2 | 23.06 | 23.25 | 2.05 | 10.04 | 10.12 | |
| | | <i>l</i> | 23.7 22.9 23.7 | 23.43 | ..... | ..... | ..... | ..... |  |
| | | <i>x</i> | 54.2 54.7 54.2 | 54.37 | ..... | ..... | ..... | ..... |  |
| | | <i>k</i> | 41.1 41.7 40.9 | 41.23 | ..... | ..... | ..... | ..... |  |
| | | <i>t</i> | 40.3 39.9 40.1 | 40.10 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 17.9 19.0 17.7 | 18.20 | ..... | ..... | ..... | ..... |  |
| | | <i>e</i> | 24.3 26.2 25.7 | 25.40 | ..... | ..... | ..... | ..... |  |
| 20 48 | 45 | <i>b</i> | 11.8 11.1 11.7 | 11.53 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 15.0 14.8 15.1 | 14.97 | ..... | ..... | ..... | ..... |  |
| 1904 October 31. | | | | | | | Good. | | |
| 21 50 | 34 | <i>e</i> | 20.8 21.1 21.1 | 21.00 | 20.72 | 1.79 | 10.22 | 10.30 | |
| | | <i>c</i> | 15.2 16.2 16.7 | 16.03 | 15.50 | 1.12 | 9.55 | 9.63 | |
| | | <i>t</i> | 32.8 33.1 34.0 | 33.37 | 33.67 | 3.04 | 11.47 | 11.55 | |
| | | <i>k</i> | 37.6 37.3 37.6 | 37.50 | 35.94 | 3.29 | 11.72 | 11.80 | |
| | | <i>x</i> | 50.8 50.2 51.4 | 50.80 | 49.77 | 4.78 | 13.21 | 13.29 | |
| | | <i>v</i> | 36.7 37.2 37.9 | 37.28 | ..... | 3.46 | 11.89 | 11.97 | |
| | | <i>l</i> | 22.0 21.9 21.8 | 21.90 | 21.72 | 1.90 | 10.33 | 10.41 | |
| | | <i>d</i> | 12.5 13.2 12.9 | 12.87 | 12.89 | 0.76 | 9.19 | 9.27 | |
| | | <i>b</i> | 5.4 6.6 6.7 | 6.23 | ..... | 0.12 | 8.55 | 8.63 | |
| | | <i>ba₁</i> | 14.9 15.7 14.1 | 14.90 | 15.05 | 1.07 | 9.50 | 9.59 | |
| | | <i>ba₁</i> | 14.9 15.7 15.0 | 15.20 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 12.9 12.9 12.9 | 12.90 | ..... | ..... | ..... | ..... |  |
| | | <i>l</i> | 20.9 21.9 21.8 | 21.53 | ..... | ..... | ..... | ..... |  |
| | | <i>x</i> | 47.2 49.2 49.8 | 48.73 | ..... | ..... | ..... | ..... |  |
| | | <i>k</i> | 34.0 34.2 34.9 | 34.37 | ..... | ..... | ..... | ..... |  |
| | | <i>t</i> | 34.2 33.7 34.0 | 33.97 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 14.9 15.2 14.8 | 14.97 | ..... | ..... | ..... | ..... |  |
| 22 18 | 29 | <i>e</i> | 20.7 20.1 20.8 | 20.53 | ..... | ..... | ..... | ..... |  |

TABLE 8.—103 T ANDROMEDÆ—Continued.

| 1904 November 2. | | | | Fair, a little dull, and unsteady. | | | | |
|---------------------|--------------------|-----------------------|-----------------|------------------------------------|------------|-----------------|------------|-----------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 21 30 | ^o 38 | <i>l</i> | 28.9 29.1 29.4 | 29.13 | 30.10 | 2.67 | 10.07 | 10.15 |
| | | <i>d</i> | 20.3 20.3 20.3 | 20.30 | 20.27 | 1.74 | 9.14 | 9.22 |
| | | <i>b</i> | 16.7 16.7 16.0 | 16.47 | 16.55 | 1.27 | 8.67 | 8.75 |
| | | <i>e</i> | 32.2 32.0 30.8 | 31.67 | 31.54 | 2.82 | 10.22 | 10.30 |
| | | <i>c</i> | 25.0 25.3 24.8 | 25.03 | 24.38 | 2.15 | 9.55 | 9.63 |
| | | <i>t</i> | 44.2 44.7 44.8 | 44.57 | 45.15 | 4.35 | 11.75 | 11.83 |
| | | <i>x</i> | 60.± | | 60.± | 5.6± | 13.0± | 13.1± |
| | | <i>k</i> | 47.2 47.9 47.0 | 47.37 | 47.60 | 4.59 | 11.99 | 12.07 |
| | | <i>v</i> | 46.0 45.9 46.5 | 46.13 | | 4.44 | 11.84 | 11.92 |
| | | <i>k</i> | 48.2 47.7 47.6 | 47.83 | | | | |
| | | <i>i</i> | 45.5 45.9 45.8 | 45.73 | | | | |
| | | <i>c</i> | 23.2 24.0 24.0 | 23.73 | | | | |
| | | <i>e</i> | 31.3 31.5 31.4 | 31.40 | | | | |
| | | <i>b</i> | 15.9 17.2 16.8 | 16.63 | | | | |
| | | <i>d</i> | 20.4 20.1 20.2 | 20.23 | | | | |
| 21 50 | 34 | <i>l</i> | 31.9 31.0 30.3 | 31.07 | | | | |
| 1905 January 14. | | | | 40-INCH. | | Fair, unsteady. | | |
| | | <i>t</i> | 34.1 34.7 33.7 | 34.17 | 33.18 | 3.00 | 11.85 | 11.93 |
| | | <i>k</i> | 33.4 33.7 33.1 | 33.40 | 32.98 | 2.96 | 11.81 | 11.89 |
| | | <i>z</i> | 56.7 58.7 58.0 | 57.80 | 57.60 | 5.37 | 14.22 | 14.30 |
| | | <i>w</i> | 53.0 51.7 51.5 | 52.07 | 51.87 | 4.99 | 13.84 | 13.92 |
| | | <i>v₀₁</i> | 9.5 8.4 11.1 | 9.67 | | 0.41 | 9.26 | 9.34 |
| | | <i>x</i> | 44.3 44.5 44.9 | 44.57 | 43.28 | 4.13 | 12.98 | 13.06 |
| | | <i>u</i> | 47.8 46.4 45.9 | 46.77 | 46.65 | 4.50 | 13.35 | 13.43 |
| | | <i>u</i> | 46.7 46.2 46.7 | 46.53 | | | | |
| | | <i>x</i> | 41.0 42.9 42.1 | 42.00 | | | | |
| | | <i>w</i> | 51.3 51.8 51.9 | 51.67 | | | | |
| | | <i>z</i> | 57.8 57.1 57.3 | 57.40 | | | | |
| | | <i>k</i> | 32.5 32.7 32.4 | 32.53 | | | | |
| 4 27 | 52 | <i>t</i> | 31.7 31.9 33.0 | 32.20 | | | | |
| 1905 January 28. | | | | Good. | | | | |
| 4 22 | | <i>t</i> | 20.0 21.2 20.7 | 20.63 | 20.33 | 1.74 | 11.83 | 11.91 |
| | | <i>k</i> | 22.0 21.9 22.3 | 22.07 | 21.04 | 1.83 | 11.92 | 12.00 |
| | | <i>z</i> | 41.2 41.3 40.7 | 41.07 | 40.67 | 3.85 | 13.94 | 14.02 |
| | | <i>w</i> | 36.1 37.0 36.4 | 36.50 | 36.05 | 3.31 | 13.40 | 13.48 |
| | | <i>y</i> | 42.7 43.6 43.3 | 43.20 | 43.08 | 4.11 | 14.20 | 14.28 |
| | | <i>x</i> | 31.9 32.1 31.7 | 31.90 | 31.34 | 2.79 | 12.88 | 12.96 |
| | | <i>u</i> | 34.0 33.9 34.1 | 34.00 | 33.62 | 3.05 | 13.14 | 13.22 |
| | | <i>u</i> | 33.1 33.8 32.8 | 33.23 | | | | |
| | | <i>x</i> | 30.0 31.0 31.3 | 30.77 | | | | |
| | | <i>y</i> | 42.5 43.3 43.1 | 42.97 | | | | |
| | | <i>w</i> | 36.3 35.0 35.5 | 35.60 | | | | |
| | | <i>z</i> | 39.8 40.0 41.0 | 40.27 | | | | |
| | | <i>k</i> | 19.8 20.3 19.9 | 20.00 | | | | |
| 4 38 | 57 | <i>t</i> | 19.8 20.9 20.0 | 20.23 | | | | |

TABLE 8.—103 T ANDROMEDÆ—Continued.

| 1905 February 25. | | | | Fair to good, low. | | | | |
|-------------------|------------|-----------------------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3 | Mean of 6. | | H. | P. |
| <i>h m</i> | ° | <i>t</i> | 22.2 22.1 22.3 | 22.20 | 21.68 | 1.89 | 11.89 | 11.97 |
| | | <i>k</i> | 21.3 22.4 22.7 | 22.13 | 20.46 | 1.75 | 11.75 | 11.83 |
| | | <i>z</i> | 41.5 42.3 42.9 | 42.23 | 42.82 | 4.08 | 14.08 | 14.16 |
| | | <i>w</i> | 40.3 39.3 40.2 | 39.93 | 40.05 | 3.79 | 13.79 | 13.87 |
| | | <i>va₁</i> | 11.5 10.4 11.4 | 11.10 | 10.82 | 0.53 | 10.53 | 10.61 |
| | | <i>y</i> | 48.2 48.1 48.9 | 48.40 | 47.76 | 4.60 | 14.60 | 14.68 |
| | | <i>x</i> | 32.5 33.8 32.9 | 33.07 | 33.25 | 3.00 | 13.00 | 13.08 |
| | | <i>u</i> | 35.2 35.1 34.7 | 35.00 | 34.68 | 3.16 | 13.16 | 13.24 |
| | | <i>u</i> | 34.4 34.0 34.7 | 34.37 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 32.8 34.2 33.3 | 33.43 | ..... | ..... | ..... | ..... |
| | | <i>y</i> | 46.9 47.3 47.2 | 47.13 | ..... | ..... | ..... | ..... |
| | | <i>va₁</i> | 10.2 10.3 11.1 | 10.53 | ..... | ..... | ..... | ..... |
| | | <i>w</i> | 40.6 39.8 40.1 | 40.17 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 42.5 44.5 43.2 | 43.40 | ..... | ..... | ..... | ..... |
| | | <i>k</i> | 18.2 21.3 19.9 | 19.80 | ..... | ..... | ..... | ..... |
| | | <i>t</i> | 20.0 21.7 21.8 | 21.17 | ..... | ..... | ..... | ..... |
| | 35 | | | | | | | |

Table 8 gives the detailed photometric measures and reductions of the comparison stars in Table 7, based on the stars in Table 5. The series measured on three nights with the 6-inch includes the three catalogue stars *A*, *B*, and *a*, also the six comparison stars, *b*, *c*, *d*, *e*, *l*, and *s*. A complete series consists of three settings on each star in the list, followed immediately by three more settings on the stars in reverse order. Thus the mean of the times is the same for each star and any progressive changes in the real or the artificial star will be eliminated. In the seventh column there are two mean scale readings for each star, which are united into the single mean of the eighth column. The ninth column contains the values of *C* (curve reading) corresponding to each mean scale reading. These are taken from the absorption curves, E 6 for the 6-inch and A 12 for the 12- and 40-inch, and express the relative magnitudes of the stars as explained below. To convert *C* into magnitudes in the system of the catalogue, it is increased by the quantity M_0 taken from Table 9. For example, on October 15 the mean *C* for the three standard stars is 0.88; the mean of their magnitudes from the H. C. O. Catalogue is 7.69; the difference in the two quantities, called M_0 , is 6.81. If M_0 be added to each *C*, the mean of the sums for the three standard stars will agree with the mean of their catalogue magnitudes, and the separate sums will preserve the relative magnitudes as measured. The quantity M_0 is the magnitude of the zero reading on the absorption curve, and when increased by the *C* of each star will give the magnitude in the system used. In the example we are using the M_0 in the Potsdam system is 6.89. Adding these values of M_0 to *C* we have the last two columns of Table 8, the measured magnitudes in the H. C. O. and P. DM. systems.

The sidereal time and zenith distance, given in the first two columns of Table 8, serve to show that no correction is needed for change in atmospheric absorption due to difference in zenith distance between the standard stars and the stars to be measured. For example, on October 15, when the field was near the meridian,

the mean zenith distance of the three standard stars was $\frac{1}{2}^\circ$ less than that of the measured stars. At zenith distance 21° a difference of $\frac{1}{2}^\circ$ corresponds to a change of 0.001 magnitude in the atmospheric absorption, which is negligible. The stars measured with the 12- and 40-inch were all within $20'$ of the variable, so that the correction would be even less. The subscript a_1 , appended to the star letter, shows that the star was measured through one shade glass, which increases the magnitude numerically by 0.75 for the 6-inch and 0.84 for the 12- and 40-inch measures.

TABLE 9.—103 T ANDROMEDÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|----------------------|-------------|-----------|------|---------------|-----------|-------------|-----------|------|---------------|-----------|-------------|-----------|------|---------------|-----------|
| Star. | October 15. | | | | | October 27. | | | | | October 30. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | | |
| A | 0.84 | 7.65 | 7.73 | -.02 | -.03 | 0.44 | 7.63 | 7.71 | -.04 | -.05 | 0.43 | 7.55 | 7.63 | -.12 | -.13 |
| B | 0.63 | 7.44 | 7.52 | +.23 | +.10 | 0.30 | 7.49 | 7.57 | +.28 | +.15 | 0.37 | 7.49 | 7.57 | +.28 | +.15 |
| a | 1.16 | 7.97 | 8.05 | -.23 | -.07 | 0.76 | 7.95 | 8.03 | -.25 | -.09 | 0.90 | 8.02 | 8.10 | -.18 | -.02 |
| Means. | 0.88 | 7.69 | 7.77 | $\pm .16$ | $\pm .07$ | 0.50 | 7.69 | 7.77 | $\pm .19$ | $\pm .10$ | 0.57 | 7.69 | 7.77 | $\pm .19$ | $\pm .10$ |
| M ₀..... | ..... | 6.81 | 6.89 | ..... | ..... | ..... | 7.19 | 7.27 | ..... | ..... | ..... | 7.12 | 7.20 | ..... | ..... |

| 12-INCH. | | | | | 40-INCH. | | | | |
|----------------------|-----------------|-----------|----------|---------|----------------------|------------------|----------|----------|----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | |
| | | Sept. 11. | Oct. 31. | Nov. 2. | | | Jan. 14. | Jan. 28. | Feb. 25. |
| b..... | 8.81 | 0.88 | 0.19 | 1.27 | k..... | 11.85 | 2.96 | 1.83 | 1.75 |
| c..... | 9.33 | 1.43 | 1.12 | 2.15 | t..... | 11.66 | 3.00 | 1.74 | 1.89 |
| d..... | 9.22 | 1.07 | 0.76 | 1.74 | x..... | 13.12 | 4.13 | 2.79 | 3.00 |
| Mean C.. | ..... | 1.13 | 0.69 | 1.72 | Mean C... | ..... | 3.36 | 2.12 | 2.21 |
| Mean Mag. | 9.12 | 9.12 | 9.12 | 9.12 | Mean Mag. | 12.21 | 12.21 | 12.21 | 12.21 |
| M ₀..... | ..... | 7.99 | 8.43 | 7.40 | M ₀..... | ..... | 8.85 | 10.09 | 10.00 |

Table 9 contains the values of C, the reading from the absorption-curve of the wedge. From the mean C we derive the M₀ used in the reductions. In the first part of the table (6-inch) the observed magnitudes of the three standard stars are given, both in the Harvard and Potsdam systems, in the columns headed H. and P. Subtracting the catalogue magnitudes in Table 5 from these observed values gives the residuals tabulated under " Δ Mag." for each system. The conclusions which may be drawn from these residuals are discussed in Chapter XIV. As the measures with the 12-inch are based on the standards fixed with the 6-inch, the second division of the table contains the 6-inch magnitudes of the three standard stars *b*, *c*, and *d*, from Table 10, and the values of C found on the three nights with the resulting values of M₀. Similarly the 40-inch division of the table gives the magnitudes derived with the 12-inch for *k*, *t*, and *x*, with C and M₀. In the last two divisions the magnitudes are given in the Harvard system only, to express them in the Potsdam system add 0.08 as shown in Table 5.

TABLE 10.—103 T ANDROMEDÆ. MEAN MAGNITUDES.

6-INCH.

| Star. | October 15. | | October 27. | | October 30. | | Mean. | | |
|----------------|-------------|---------------|-------------|---------------|-------------|---------------|---------|---------|---------------|
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>A</i> | 7.65 | +0.04 | 7.63 | +0.02 | 7.55 | -0.06 | 7.61 | 7.69 | ± 0.04 |
| <i>B</i> | 7.44 | -0.03 | 7.49 | +0.02 | 7.49 | +0.02 | 7.47 | 7.55 | ± 0.02 |
| <i>a</i> | 7.97 | -0.01 | 7.95 | -0.03 | 8.02 | +0.04 | 7.98 | 8.06 | ± 0.03 |
| Mean | | | | | | | 7.69 | 7.77 | ± 0.03 |
| <i>b</i> | 8.88 | +0.07 | 8.85 | +0.04 | 8.71 | -0.10 | 8.81 | 8.89 | ± 0.07 |
| <i>c</i> | 9.22 | -0.11 | 9.34 | +0.01 | 9.42 | -0.09 | 9.33 | 9.41 | ± 0.07 |
| <i>d</i> | 9.04 | -0.18 | 9.27 | +0.05 | 9.36 | +0.14 | 9.22 | 9.30 | ± 0.12 |
| <i>e</i> | 10.43 | +0.18 | 10.08 | -0.17 | 10.25 | 0.00 | 10.25 | 10.33 | ± 0.12 |
| <i>l</i> | 10.23 | +0.01 | 10.24 | +0.02 | 10.19 | -0.03 | 10.22 | 10.30 | ± 0.02 |
| <i>s</i> | 10.33 | +0.01 | 10.11 | -0.21 | 10.51 | +0.19 | 10.32 | 10.40 | ± 0.14 |
| Mean | | | | | | | 9.69 | 9.77 | ± 0.09 |

12-INCH.

| Star. | September 11. | | October 31. | | November 2. | | Mean. | | |
|----------------|---------------|---------------|-------------|---------------|-------------|---------------|---------|---------|---------------|
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>b</i> | 8.87 | +0.15 | 8.62 | -0.10 | 8.67 | -0.05 | 8.72 | 8.80 | ± 0.10 |
| <i>c</i> | 9.42 | -0.09 | 9.55 | +0.04 | 9.55 | +0.04 | 9.51 | 9.59 | ± 0.06 |
| <i>d</i> | 9.06 | -0.06 | 9.19 | +0.07 | 9.14 | +0.02 | 9.12 | 9.20 | ± 0.05 |
| Mean | | | | | | | 9.12 | 9.20 | ± 0.07 |
| <i>e</i> | 10.16 | -0.04 | 10.22 | +0.02 | 10.22 | +0.02 | 10.20 | 10.28 | ± 0.03 |
| <i>k</i> | 11.84 | -0.01 | 11.72 | -0.13 | 11.99 | +0.14 | 11.85 | 11.93 | ± 0.09 |
| <i>l</i> | 10.04 | -0.11 | 10.33 | +0.18 | 10.07 | -0.08 | 10.15 | 10.23 | ± 0.12 |
| <i>t</i> | 11.77 | +0.11 | 11.47 | -0.19 | 11.75 | +0.09 | 11.66 | 11.74 | ± 0.13 |
| <i>x</i> | 13.16 | +0.04 | 13.21 | +0.09 | 13.04 | -0.12 | 13.12 | 13.20 | ± 0.08 |
| Mean | | | | | | | 11.40 | 11.48 | ± 0.09 |

40-INCH.

| Star. | January 14. | | January 28. | | February 25. | | Mean. | | |
|----------------|-------------|---------------|-------------|---------------|--------------|---------------|---------|---------|---------------|
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>k</i> | 11.81 | -0.02 | 11.92 | +0.09 | 11.75 | -0.08 | 11.83 | 11.91 | ± 0.06 |
| <i>t</i> | 11.85 | -0.01 | 11.83 | -0.03 | 11.89 | +0.03 | 11.86 | 11.94 | ± 0.02 |
| <i>x</i> | 12.98 | +0.03 | 12.88 | -0.07 | 13.00 | +0.05 | 12.95 | 13.03 | ± 0.05 |
| Mean | | | | | | | 12.21 | 12.29 | ± 0.04 |
| <i>u</i> | 13.35 | +0.13 | 13.14 | -0.08 | 13.16 | -0.06 | 13.22 | 13.30 | ± 0.09 |
| <i>w</i> | 13.84 | +0.16 | 13.40 | -0.28 | 13.79 | +0.11 | 13.68 | 13.76 | ± 0.18 |
| <i>y</i> | | | 14.20 | -0.20 | 14.60 | +0.20 | 14.40 | 14.48 | ± 0.20 |
| <i>z</i> | 14.22 | +0.14 | 13.94 | +0.14 | 14.08 | 0.00 | 14.08 | 14.16 | ± 0.09 |
| Mean | | | | | | | 13.85 | 13.93 | ± 0.14 |

Table 10 collects the magnitude results for each night from Table 8 and forms the means. The magnitudes for the separate nights are expressed in the Harvard system, and followed by the column " Δ Mag." giving the residuals from the mean of three nights. The columns of means give the magnitude in both systems, and lastly the means of the separate residuals.

Table 11 gives the comparisons of the variable by Argelander's method (including a few photometric and photographic), the resulting photometric magnitudes of the variable, and a comparison with the mean light-curve. The Central Time (6 hours west of Greenwich) is given in the third column to the nearest hour, but as the records were usually made to the nearest quarter hour, the decimal of the Julian day in the fourth column is carried farther and sometimes differs by one or two hundredths from the hour in column three. In the fifth column, "Aperture," 6 stands for the $6\frac{1}{2}$ -inch Brashear reflector (clear aperture equivalent to 6.2 inches = 15 cm.), 3 for the same with diaphragm, 12 and 40 for the Yerkes refractors (30 and 102 cm. respectively), 24 for the 60 cm. reflector.

The comparisons in the seventh column, unless otherwise stated, were made by Argelander's method, the comparison stars being denoted by letters, v standing for the variable. The stars compared were brought equally distant from the center of the field and the head turned till the line joining the eyes was parallel to that joining the stars. Then by glancing from one star to the other the interval in steps was estimated. In the records the brighter star is given first; $c\ v$ is read " c is one step brighter than the variable;" b_4-5v , b is four or five steps brighter than the variable. When the variable was not seen the limiting magnitude is usually estimated from the faintest comparison star visible, for example "limit $4 < e$ " means that the limit of visibility is four steps fainter than e .

The reductions in columns 8, 9, and 10 were made as follows: (1) The light scale was formed in the usual manner from all the step intervals in column 7, with the results given in the fifth column of Table 7. (2) Each comparison in the seventh column then gives the brightness of the variable in steps, column 8. For example, on the first date, since $b = 39.0$ steps, the comparison b_4-5v gives 34.5 for the brightness of the variable. (3) To form the mean step values for the ninth column, if the estimated interval is greater than two or three steps the results are weighted inversely as the interval. (4) To obtain the corresponding photometric magnitudes given in the tenth column in the Harvard system, recourse is had to the "Magnitude-Curve" (fig. 4). Using the data in Table 7, for the stars measured with the photometer, the step values are platted as ordinates and the magnitudes as abscissæ. (5) A smooth curve is drawn through the platted points, giving from the step values in the ninth column the magnitudes in the tenth. The step values of the stars not measured are entered in crosses on the magnitude-curve, and the resulting magnitudes are given in Table 7, eighth and ninth columns.

TABLE II.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing | <i>t</i> | Δ Mag |
|-----|----------------|---------------|---------------------|---------|-----------|--|-----------------------------|--------------|--------------|--------|----------|--------------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1894 | | 2410000+ | | | | | | | | | |
| 1 | Mar. 15 | 7 | 2903.54 | ... | 6 | <i>b4-5v, c1v, v1-2d</i> | 34.5, 32.6, 36.2..... | 34.4 | 9.27 | moon | 0 | +0.45 |
| 2 | 17 | 7 | 2905.54 | ... | 6 | <i>c1-2v</i> , difficult ..... | ..... | 32.1 | 9.60 | fair | 2 | +0.74 |
| 3 | 21 | 7 | 2909.54 | ... | 6 | { <i>v</i> glimpsed, <i>b2-3 v</i> ?... } { <i>d</i> glimpsed ..... | ..... | 36.5 | 8.97 | low | 6 | +0.04 |
| 4 | 23 | 7 | 2911.54 | ... | 6 | <i>v</i> not seen, trees, etc. .... | ..... | ..... | ..... | .... | 8 | .... |
| 5 | 26 | 17 | 2914.96 | ... | 6 | twilight too bright ..... | ..... | ..... | ..... | .... | 11 | .... |
| 6 | Apr. 1 | 16 | 2920.94 | ... | 6 | <i>c</i> and <i>d</i> seen, <i>v</i> uncertain ..... | ..... | 34 | 9.3 | .... | 17 | .... |
| 7 | 3 | 16 | 2922.92 | 40 | 6 | <i>d1-2v</i> , quite certain ..... | ..... | 33.2 | 9.47 | good | 19 | +0.17 |
| 8 | 11 | 16 | 2930.92 | ... | 6 | <i>d2-3v</i> , uncertain ..... | ..... | 32.2 | 9.59 | fair | 27 | -0.01 |
| 9 | 15 | 16 | 2934.92 | 40 | 6 | <i>d2v, c2-3v</i> | 32.7, 31.6..... | 31.8 | 9.64 | low | 31 | -0.13 |
| 10 | 24 | 16 | 2943.92 | 150 | 6 | <i>d3-4v</i> | 31.2 ..... | ..... | ..... | .... | 40 | -0.37 |
| 11 | 27 | 16 | 2946.92 | ... | 6 | <i>d3v, c4v, v1-2e</i> | 31.7, 29.6, 32.2 | 31.2 | 9.74 | fair | 43 | -0.52 |
| 12 | May 2 | 16 | 2951.92 | ... | 6 | <i>d3v, v0-1e</i> | 31.7, 31.2 | 31.4 | 9.70 | fair | 48 | -0.40 |
| 13 | 7 | 15 | 2956.88 | ... | 6 | <i>e1v, (e1-2v)</i> | 29.2, 29.1, 29.2..... | 29.2 | 10.02 | low | 53 | -0.60 |
| 14 | 24 | 15 | 2973.88 | ... | 6 | <i>d5-6v, c4-5v, e1-2v</i> | 29.2, 29.1, 29.2..... | 29.2 | 10.02 | fair | 70 | -0.30 |
| 15 | June 30 | 11 | 3010.71 | ... | 6 | <i>e6v, v3h</i> | 24.7, 21.9 | 22.8 | 10.99 | fair | 107 | .... |
| 16 | July 29 | 10 | 3039.67 | ... | 6 | <i>v</i> not held, <i>h</i> and <i>k</i> seen... <i>v</i> not held, limit $4 < e$... | ..... ..... | < 14 < 27 | 12.3 10.3 | fair | .... | .... |
| 17 | Nov. 15 | 6 | 3148.50 | 40 | 6 | <i>b3v, d0-1v, v1-2c</i> | 36.0, 34.2, 35.1..... | 35.1 | 9.18 | fair | 245 | +0.38 |
| 18 | 20 | 7 | 3153.54 | ... | 6 | <i>v4c, v6, v2d, a4v</i> | 37.6, 39.0, 36.7, 38.0..... | 37.8 | 8.78 | good | 250 | +0.18 |
| 19 | 23 | 7 | 3156.54 | 40 | 6 | <i>a2v, v3d, v1b, h2k</i> | 40.0, 37.7, 40.0..... | 39.2 | 8.58 | fine | 253 | +0.03 |
| 20 | 26 | 7 | 3159.54 | 150 | 6 | limit $2-3 < k$? ..... | ..... | ..... | ..... | .... | 256 | +0.02 |
| 21 | Dec. 2 | 6 | 3165.50 | 40 | 6 | <i>a2-3v, v4d, v1b</i> | 39.5, 38.7, 40.0..... | 39.4 | 8.54 | good | 262 | -0.04 |
| 22 | 5 | 8 | 3168.58 | 40 | 6 | <i>a3v, v5d, v2b</i> | 39.0, 39.7, 41.0..... | 39.7 | 8.50 | good | 265 | +0.03 |
| 23 | 13 | 6 | 3176.50 | 40 | 6 | <i>v1b, a2-3v, v4d</i> | 40.0, 39.5, 38.7..... | 39.0 | 8.60 | good | 273 | -0.17 |
| 24 | 17 | 6 | 3180.50 | 40 | 6 | <i>a2-3v, v3-4d, v1b</i> | 39.5, 38.2, 40.0..... | 39.4 | 8.52 | good | 277 | -0.07 |
| 25 | 20 | 7 | 3183.54 | 40 | 6 | <i>a2v, v2d, v1b</i> | 40.0, 36.7, 40.0..... | 38.4 | 8.67 | fine | 280 | -0.13 |
| 26 | 25 | 7 | 3188.54 | 40 | 6 | <i>a3v, v4d, v1-2b</i> | 39.0, 38.7, 40.5..... | 38.5 | 8.66 | fair | 3 | -0.10 |
| 27 | 29 | 7 | 3192.54 | 40 | 6 | <i>a3v, v4d, v1-2b</i> | 38.5, 38.2..... | 37.8 | 8.78 | good | 7 | -0.38 |
| | | | | 6 | 3 | <i>a3-4v, v3-4d, (k3-4l?)</i> | 39.0, 37.7, 38.5..... | 38.9 | 8.62 | good | .... | .... |
| | | | | 3 | 6 | <i>a3v, v3d, b0-1v</i> | 37.5, 38.2..... | ..... | ..... | .... | .... | .... |
| | | | | 6 | 3 | <i>b1-2v, v3-4d</i> | 38.0, 37.7, 38.0..... | ..... | ..... | .... | .... | .... |
| | | | | 3 | 6 | { <i>b1v, v3d, a4v</i> ..... | ..... | ..... | ..... | .... | .... | .... |
| | | | | 40 | 6 | ..... | ..... | ..... | ..... | .... | .... | .... |
| 28 | Jan. 1 | 7 | 3195.54 | 40 | 6 | <i>a4v, v4d, b2-3v</i> | 38.0, 38.7, 36.5..... | 37.6 | 8.80 | good | 10 | -0.23 |
| 29 | 3 | 7 | 3197.54 | 40 | 6 | <i>a3-4v, b1-2v, v2d</i> | 38.5, 37.5, 36.5..... | 36.4 | 8.98 | good | 12 | -0.12 |
| 30 | 7 | 7 | 3201.54 | 40 | 6 | <i>a5-6v, v2-3d, b2-3v</i> | 36.5, 37.2, 35.6..... | 36.5 | 8.97 | .... | 16 | -0.25 |
| 31 | 15 | 7 | 3209.54 | 40 | 6 | <i>b3v, v2d</i> | 36.0, 36.7..... | 35.4 | 9.12 | .... | 24 | -0.36 |
| 32 | 22 | 6 | 3216.50 | 40 | 6 | <i>b2v, v2d</i> | 37.0, 36.7..... | 33.3 | 9.43 | good | 31 | -0.34 |
| 33 | 26 | 7 | 3220.54 | 40 | 6 | <i>b2-3v, v2d</i> | 36.5, 36.7..... | 32.5 | 9.55 | good | 35 | -0.36 |
| 34 | 31 | 7 | 3225.54 | 40 | 6 | <i>b3v, v0-1d, v1-2c</i> | 36.0, 35.2, 35.1..... | 31.3 | 9.72 | poor | 40 | -0.38 |
| 35 | Feb. 15 | 7 | 3240.54 | 40 | 6 | <i>d3v, v6, v4e</i> | 31.7, 33.6, 34.7..... | 28.4 | 10.15 | good | 55 | -0.54 |
| 36 | 21 | 7 | 3246.54 | 40 | 6 | <i>d2-3v, c2v, v3e</i> | 32.2, 31.6, 33.7..... | 24.6 | 10.71 | good | 61 | -0.21 |
| 37 | Mar. 1 | 7 | 3254.54 | 40 | 6 | <i>d4v, c3-4v, v3e, v4l</i> | 30.7, 30.1, 33.7, 30.5..... | 22.2 | 11.07 | good | 69 | -0.14 |
| 38 | 11 | 7 | 3264.54 | 40 | 6 | <i>e2-3v, v2l</i> | 28.2, 28.5..... | < 26 | < 10.0 | poor | 79 | .... |
| 39 | 16 | 7 | 3269.54 | 40 | 6 | <i>e3v, l3v, v3m, v5h</i> | 27.7, 23.5, 23.5, 23.9..... | < 25 | < 10.6 | good | 84 | .... |
| 40 | 7 | 7 | 3270.54 | 40 | 6 | <i>l5v, v4h</i> | 21.5, 22.9 | < 26 | < 10.5 | fair | 85 | .... |
| 41 | May 26 | 14 | 3310.83 | 40 | 6 | <i>v</i> not seen, limit <i>l</i> ..... | ..... | < 16 | < 12.0 | fair | 125 | .... |
| 42 | July 24 | | 3399.63 | 150 | 6 | <i>v</i> not seen, limit $1 < l$ ..... | ..... | 27.7 | 10.24 | fair | 214 | -0.37 |
| | | | | 40 | 6 | <i>v</i> not seen, limit <i>l</i> ..... | ..... | ..... | ..... | .... | .... | .... |
| | | | | 40 | 6 | <i>v</i> not seen, limit $2-3 < h$ ..... | ..... | ..... | ..... | .... | .... | .... |
| | | | | 40 | 6 | <i>v8h</i> | 26.9..... | ..... | ..... | .... | .... | .... |
| | | | | 40 | 6 | <i>e3v, v2l</i> | 27.7, 28.5..... | ..... | ..... | .... | .... | .... |

TABLE 11.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|-------------|-----------|--------------------------------|---|--------|--------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 43 | 1895 Aug. 5 | 9 | 2410000+ | ... | 6 | d2v, c3v..... | 32.7, 30.6 | 31.6 | 9.68 | moon | 226 | -0.22 |
| 44 | 8 | 8 | 3411.63 | 40 | 6 | v4-5l, c1v, v5e, v2f, d1-2v { | 31.0, 32.6, 35.7... 31.5, 33.2 | 32.8 | 9.51 | fair | 229 | -0.26 |
| 45 | 12 | 9 | 3418.63 | 40 | 6 | v6l, v3c, v1d, b4v..... | 32.5, 36.6, 35.7... 35.0 | 35.0 | 9.20 | good | 233 | -0.29 |
| 46 | 25 | 8 | 3431.58 | 40 | {6 | a4, v2, vb, v5d..... | 38.0, 39.0, 39.7... 39.0, 38.0, 38.7...} | 38.8 | 8.63 | good | 246 | -0.10 |
| 47 | 26 | 8 | 3432.58 | 40 | {3 | a3v, b1v, v4d..... | 37.5, 37.0, 37.7... 39.0, 39.7, 40.5...} | 37.4 | 8.82 | good | 247 | +0.12 |
| 48 | 30 | 8 | 3436.58 | 40 | {6 | a3v, v5d, v1-2b..... | 38.0, 38.0, 39.2... 39.0, 37.7, 38.0...} | 39.0 | 8.60 | good | 251 | +0.01 |
| 49 | Sept. 2 | 9 | 3439.63 | 40 | {3 | a4v, b1v, v4-5d..... | 39.0, 39.5, 39.7... 39.0, 37.0, 38.7...} | 39.4 | 8.55 | fair | 254 | +0.01 |
| 50 | 9 | 8 | 3446.58 | 40 | {3 | a3v, b2v, v4d..... | 39.5, 38.2, 39.5... 39.0, 37.7, 38.0...} | 38.2 | 8.72 | poor | 261 | +0.19 |
| 51 | 16 | 8 | 3453.58 | 40 | 6 | a2-3v, v3-4d, v0-1b..... | 40.0, 38.7, 39.0... 38.5, 38.7 | 39.1 | 8.59 | fair | 268 | -0.01 |
| 52 | 17 | 7 | 3454.54 | 40 | {3 | a3v, v3d, b1v..... | 39.0, 37.7, 38.0... 40.0, 38.7, 39.0...} | 38.7 | 8.63 | good | 269 | +0.02 |
| 53 | 26 | 7 | 3463.54 | 40 | {6 | a2v, v4d, vb..... | 38.5, 38.7 | 38.4 | 8.70 | fair | 278 | -0.07 |
| 54 | Oct. 5 | 7 | 3472.54 | 40 | {3 | a3v, v3d, b1v..... | 39.0, 37.7, 38.0... 40.0, 40.7, 40.5...} | 40.4 | 8.38 | fair | 5 | -0.53 |
| 55 | 9 | 8 | 3476.58 | 40 | 6 | a2v, v6d, v1-2b..... | 38.0, 37.7 | 37.8 | 8.78 | good | 9 | -0.22 |
| 56 | 15 | 8 | 3482.58 | 40 | 6 | b1v, v3d..... | 35.0, 35.2, 37.6... 33.0, 34.7, 35.6...} | 35.6 | 9.10 | good | 15 | -0.09 |
| 57 | 19 | 7 | 3486.54 | 40 | 6 | b4v, v0-1d, v4c..... | 36.0, 34.7, 34.6... 32.7, 32.6, 33.5...} | 34.4 | 9.27 | good | 19 | -0.03 |
| 58 | 23 | 7 | 3490.54 | 40 | 6 | b6v, vd, v2c..... | 30.9 | 35.1 | 9.18 | good | 23 | -0.29 |
| 59 | Nov. 1 | 7 | 3499.54 | 40 | 6 | b3v, vd, v1c..... | 31.6, 32.7, 32.5... 30.9 | 32.9 | 9.50 | fair | 32 | -0.29 |
| 60 | 10 | 7 | 3508.54 | 40 | 6 | d2v, c1v, v4f..... | 30.6, 32.2, 28.5... 24.5, 25.0 | 31.9 | 9.63 | good | 41 | -0.50 |
| 61 | 15 | 7 | 3513.54 | 40 | 6 | c2v, v2e, v3f, v4-5l..... | 21.5, 22.5, 22.9... 17.5, 20.5, 20.2...} | 30.4 | 9.85 | good | 46 | -0.48 |
| 62 | Dec. 2 | 6 | 3530.50 | 40 | 6 | c3v, v1-2e, v2l..... | 24.8 | 24.8 | 10.68 | moon | 63 | -0.30 |
| 63 | 9 | 7 | 3537.54 | 40 | 6 | l2v, v4-5m..... | 22.3 | 22.3 | 11.05 | good | 70 | -0.22 |
| 64 | 25 | 7 | 3553.54 | 150 | 6 | l5v, v2m, v4h..... | 19.8 | 19.8 | 11.42 | fair | 86 | -0.47 |
| 65 | 1896 Jan. 6 | 7 | 3565.54 | 150 | 6 | l8-10v, vm, v2h..... | 15.9, 15.8 | 15.8 | 12.00 | fair | 98 | -0.36 |
| 66 | 13 | 7 | 3572.54 | 150 | 6 | h3v, v1-2k..... | 14.9, 15.3 | 15.1 | 12.11 | good | 105 | -0.40 |
| 67 | 20 | 7 | 3579.54 | 150 | 6 | h4v, v1k, limit 3 < k..... | 14.3 | 14.3 | 12.22 | moon | 112 | -0.45 |
| 68 | Feb. 5 | 7 | 3595.54 | 150 | 6 | vk..... | 11.8 | 11.8 | 12.60 | fair | 128 | -0.20 |
| 69 | 8 | 7 | 3598.54 | 150 | 6 | k2-3v, limit v..... | 11.8 | 11.8 | 12.60 | good | 131 | -0.21 |
| 70 | 21 | 7 | 3611.54 | 150 | 6 | k2-3v, limit v..... | < 16 | < 16 | < 12.0 | moon | 144 | .... |
| 71 | Mar. 1 | 7 | 3620.54 | 150 | 6 | v not seen, limit 3 < h..... | < 12 | < 12 | < 12.6 | good | 153 | .... |
| 72 | 3 | 7 | 3622.56 | 40 | 6 | v not seen, limit 2 < k..... | < 16 | < 16 | < 12.0 | good | 155 | .... |
| 73 | 12 | 7 | 3631.54 | ... | 6 | v not seen, limit 1-2 < h..... | < 19 | < 19 | < 11.5 | poor | 164 | .... |
| 74 | Aug. 3 | 10 | 3775.67 | 40 | 6 | v not seen, limit h..... | 31.0, 31.7 | 31.4 | 9.70 | good | 26 | +0.15 |
| 75 | 27 | 9 | 3799.63 | 150 | 6 | v4-5l, d3v..... | 23.5, 23.4 | 23.4 | 10.88 | good | 50 | +0.40 |
| 76 | Sept. 7 | 8 | 3810.58 | 150 | 6 | l3v, v4-5h..... | 21.5, 23.4 | 22.4 | 11.03 | good | 61 | +0.13 |
| 77 | 25 | 7 | 3828.54 | 150 | 6 | l5v, v4-5h..... | 15.9, 15.3 | 15.6 | 12.04 | good | 79 | +0.62 |
| 78 | Oct. 6 | 7 | 3839.54 | 150 | 6 | h3v, v1k..... | 16.9, 16.3 | 16.6 | 11.88 | good | 90 | -0.19 |
| 79 | 24 | 6 | 3857.52 | 80 | 6 | h2v, v2k..... | 13.3 | 13.3 | 12.37 | good | 108 | -0.32 |
| 80 | Nov. 26 | 8 | 3890.58 | 150 | 6 | k1v, limit 1-2 < v..... | 9.3, 9.0 | 9.2 | 12.97 | fine | 141 | +0.17 |
| 81 | Dec. 23 | 6 | 3917.50 | 150 | 6 | k5v, x1v..... | 12.3, 11.5 | 11.9 | 12.59 | good | 168 | +0.13 |
| 82 | 1897 Jan. 6 | 6 | 3931.50 | 150 | 6 | k2v, v1-2x..... | 13.4, 15.8 | 15.0 | 12.12 | good | 182 | +0.02 |
| 83 | 19 | 7 | 3944.54 | 150 | 6 | h5-6v, v1-2k..... | 18.4, 18.8 | 18.6 | 11.59 | good | 195 | +0.06 |
| 84 | 28 | 7 | 3953.54 | { 40 150 | 6 | h0-1v, v4-5k..... | 18.9, 22.5 | 20.1 | 11.37 | good | 204 | +0.25 |
| 85 | Feb. 13 | 7 | 3969.54 | { 150 40 | 6 | vh, l4v..... | 19.4, 19.5 | 25.4 | 10.56 | good | 220 | +0.31 |
| 86 | May 24 | 15 | 4069.88 | 150 | 6 | v0-1h, l6-8v..... | 25.5, 26.9 | 23.2 | 10.91 | good | 39 | +0.84 |
| 87 | July 21 | 10 | 4127.67 | 150 | 6 | l1v, v8h..... | 24.5 | 12.3 | 12.51 | fair | 97 | +0.21 |
| 88 | 27 | 10 | 4133.67 | 150 | 6 | l2v..... | 10.3, 10.5 | 10.4 | 12.80 | good | 103 | +0.32 |
| 89 | Aug. 19 | 9 | 4156.63 | 150 | 6 | l5v, v6h..... | 10.3 | 10.3 | 12.81 | fair | 126 | +0.01 |
| 90 | 27 | 9 | 4164.63 | 150 | 6 | k2v, limit v..... | 10.3, 10.5 | 10.4 | 12.80 | good | 134 | -0.01 |

TABLE 11.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|---------------------------|------------------------|--------|--------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1897 | | 2410000+ | | | | | | | | | |
| 91 | Sept. 16 | 7 | 4184.54 | 150 | 6 | k4-5v, x not seen..... | ..... | 9.8 | 12.90 | fair | 153 | +0.22 |
| 92 | 20 | 8 | 4188.58 | 150 | 6 | k2v, v4x, limit x..... | 12.3, 14.0..... | 13.2 | 12.38 | good | 157 | -0.27 |
| 93 | 24 | 8 | 4192.58 | 150 | 6 | k1v, v5x, h4v..... | 13.3, 15.0, 14.9... | 14.4 | 12.20 | good | 161 | -0.38 |
| 94 | 29 | 8 | 4197.58 | 150 | 6 | v2k, h3v..... | 16.3, 15.9..... | 16.1 | 11.97 | good | 166 | -0.52 |
| 95 | Oct. 14 | 7 | 4212.54 | 150 | 6 | v2k, h1-2v..... | 16.3, 17.4..... | 16.8 | 11.85 | good | 181 | -0.29 |
| 96 | 23 | 7 | 4221.54 | 40 | 6 | h2v, v2k..... | 16.9, 16.3..... | 17.0 | 11.80 | good | 190 | +0.03 |
| | | | | 150 | 6 | h1-2v, v3k..... | 17.4, 17.3..... | | | | | |
| 97 | 25 | 6 | 4223.50 | 150 | 6 | h0-1v, v5k..... | 18.4, 19.3..... | 18.8 | 11.56 | good | 191 | -0.14 |
| | | | | 80 | 6 | h2n, n10, o1p, p1q, qk. | | | | | | |
| | | | | 80 | 6 | k4r, k2t, ls..... | 17.9, 20.3..... | 19.6 | 11.45 | good | 196 | -0.04 |
| 98 | 29 | 7 | 4227.54 | 40 | 6 | h1v, v6k..... | | | | | | |
| | | | | 150 | 6 | l6v, v1h..... | 20.5, 19.9..... | 23.7 | 10.84 | good | 209 | -0.04 |
| 99 | Nov. 11 | 7 | 4240.54 | 40 | 6 | v4h, l2v..... | 22.9, 24.5..... | | | | | |
| 100 | 17 | 7 | 4246.54 | 40 | 6 | vl, d6v..... | 26.5, 29.7..... | 27.6 | 10.27 | good | 215 | -0.27 |
| 101 | 20 | 7 | 4249.54 | 40 | 6 | v1-2l, d6v..... | 28.0, 28.7..... | 28.3 | 10.17 | good | 218 | -0.20 |
| 102 | Dec. 29 | 7 | 4288.54 | 40 | 6 | v2b, a0-1v..... | 41.0, 41.5..... | 41.2 | 8.28 | good | 257 | -0.24 |
| | 1898 | | | | | | | | | | | |
| 103 | Jan. 16 | 7 | 4306.54 | 40 | 6 | a3v, v0-1b, a4b..... | 39.0, 39.5..... | 39.2 | 8.57 | good | 275 | -0.13 |
| 104 | 23 | 6 | 4313.50 | 40 | 6 | b0-1v, v2d, v8l..... | 38.5, 36.7, 34.5.. | 37.0 | 8.90 | good | 0 | +0.08 |
| 105 | Feb. 5 | 7 | 4326.54 | 40 | 6 | d2v, v5l..... | 32.7, 31.5..... | 32.1 | 9.60 | fair | 13 | +0.48 |
| 106 | 24 | 7 | 4345.54 | 150 | 6 | d4v, v3l..... | 30.7, 29.5..... | 30.1 | 9.89 | fair | 32 | +0.11 |
| 107 | Mar. 4 | 7 | 4353.54 | 40 | 6 | l1-2v..... | ..... | 25.0 | 10.63 | fair | 40 | +0.53 |
| 108 | 13 | 7 | 4362.54 | 150 | 6 | l4v..... | ..... | 22.5 | 11.02 | fair | 49 | +0.60 |
| 109 | Aug. 29 | 8 | 4531.58 | 40 | 6 | l1v, v1s, uncertain..... | 25.5, 26.1..... | 25.8 | 10.52 | moon | 218 | +0.15 |
| 110 | Sept. 8 | 8 | 4541.58 | 40 | 6 | vl, c5v..... | 26.5, 28.6..... | 27.2 | 10.31 | fair | 228 | +0.51 |
| 111 | Oct. 11 | 7 | 4574.54 | 80 | 6 | a3-4v, v4d, v2b..... | 38.5, 38.7, 41.0.. | 39.4 | 8.54 | good | 261 | +0.01 |
| 112 | Nov. 5 | 6 | 4599.50 | 40 | 6 | b1-2v, v3-4d..... | 37.5, 38.2..... | 37.8 | 8.78 | good | 4 | -0.11 |
| 113 | 19 | 7 | 4613.54 | 40 | 6 | b4-5v, v3l, d0-1v, vic.. | 34.5, 29.5, 34.2, 34.6 | 33.2 | 9.47 | good | 18 | +0.19 |
| 114 | Dec. 3 | 7 | 4627.54 | 40 | 6 | d5v, l1v..... | 29.7, 25.5..... | 27.6 | 10.27 | good | 32 | +0.47 |
| 115 | 22 | 6 | 4646.50 | 150 | 6 | l4-5v, v5h..... | 22.0, 23.9..... | 23.0 | 10.94 | good | 51 | +0.42 |
| | 1899 | | | | | | | | | | | |
| 116 | Jan. 2 | 6 | 4657.50 | 150 | 6 | l3v, v1h..... | 23.5, 19.9..... | 21.1 | 11.20 | poor | 62 | +0.25 |
| 117 | 9 | 6 | 4664.5 | 150 | 6 | l6-8v, v3k, v2h..... | 19.5, 17.3, 20.9.. | 19.2 | 11.50 | fair | 69 | +0.30 |
| 118 | 24 | 6 | 4679.5 | 150 | 6 | h2-3v, k2v..... | 16.4, 12.3..... | 14.4 | 12.20 | moon | 84 | +0.43 |
| 119 | Feb. 15 | 6 | 4701.5 | 150 | 6 | k4v, limit v..... | ..... | 10.3 | 12.81 | moon | 106 | +0.28 |
| 120 | 28 | 8 | 4714.58 | 150 | 6 | k4-5v, limit v..... | ..... | 9.8 | 12.89 | low | 119 | +0.16 |
| 121 | Mar. 7 | 7 | 4721.54 | 150 | 6 | v not seen, limit 1-2 < h | ..... | < 17 | < 11.8 | .... | 126 | .... |
| 122 | Aug. 10 | 9 | 4877.63 | 40 | 6 | a4v, vb, v3d..... | 38.0, 39.0, 37.7.. | 38.2 | 8.72 | fair | 0 | -0.01 |
| 123 | 18 | 8 | 4885.58 | 40 | 6 | b2-3v, v2d..... | 36.5, 36.7..... | 36.6 | 8.98 | moon | 8 | -0.02 |
| 124 | Sept. 1 | 8 | 4899.58 | 40 | 6 | b4v, d1v, vic..... | 35.0, 33.7, 34.6.. | 34.4 | 9.27 | fair | 22 | -0.13 |
| 125 | 13 | 7 | 4911.56 | 40 | 6 | d4v, v0-1c, v4l..... | 30.7, 34.1, 30.5.. | 31.8 | 9.64 | good | 34 | -0.23 |
| 126 | Oct. 2 | 8 | 4930.58 | 40 | 6 | c5-6v, vl, v5h..... | 28.1, 26.5, 23.9.. | 26.2 | 10.47 | good | 53 | -0.15 |
| 127 | 7 | 7 | 4935.54 | 40 | 6 | l2v, v4-5h..... | 24.5, 23.4..... | 24.0 | 10.63 | good | 58 | -0.18 |
| 128 | 23 | 7 | 4951.54 | 150 | 6 | l6v, v2h, v4k..... | 20.5, 20.9, 18.3.. | 19.9 | 11.40 | good | 74 | 0.00 |
| 129 | 30 | 7 | 4958.56 | 150 | 6 | h2-3v, v2-3k..... | 16.4, 16.8..... | 16.6 | 11.88 | good | 81 | +0.19 |
| 130 | Nov. 4 | 7 | 4963.56 | 150 | 6 | h2v, vk, x not held..... | 16.9, 14.3..... | 15.6 | 12.03 | fair | 86 | +0.13 |
| 131 | 20 | 7 | 4979.54 | 150 | 6 | k1v, v2x..... | 13.3, 12.0..... | 12.6 | 12.48 | poor | 102 | +0.03 |
| 132 | 27 | 7 | 4986.54 | 200 | 6 | k3v, v1x..... | 11.3, 11.0..... | 11.2 | 12.69 | good | 109 | +0.09 |
| 133 | Dec. 6 | 7 | 4995.54 | 150 | 6 | k3v, v1x..... | 11.3, 11.0..... | 11.2 | 12.69 | good | 118 | -0.04 |
| 134 | 19 | 7 | 5008.54 | 200 | 6 | k3v, limit v..... | ..... | 11.3 | 12.67 | fair | 131 | -0.14 |
| 135 | 23 | 7 | 5012.54 | 200 | 6 | k4v, vx, limit v or x.... | 10.3, 10.0..... | 10.2 | 12.82 | fair | 135 | +0.01 |
| 136 | 29 | 7 | 5018.52 | 200 | 6 | x0-1v, limit v..... | ..... | 10.± | 12.86 | .... | 141 | +0.06 |
| | 1900 | | | | | | | | | | | |
| 137 | Jan. 1 | 6 | 5021.50 | 200 | 6 | k5v, v0-1x..... | 9.3, 10.3..... | 9.8 | 12.89 | good | 144 | +0.09 |
| 138 | 22 | 7 | 5042.54 | 150 | 6 | v not seen, limit k..... | ..... | < 10 | < 12.9 | poor | 165 | .... |
| 139 | 24 | 7 | 5044.54 | 150 | 6 | k3v, v2-3x, limit x..... | 11.3, 12.5..... | 11.9 | 12.59 | good | 167 | +0.11 |

TABLE 11.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | <i>t</i> . | Δ Mag. |
|-----|-----------------|---------------|---------------------|---------|-----------|---|------------------------|--------|-------|---------|------------|---------------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1900 | | 2410000+ | | | | | | | | | |
| 140 | Feb. 15 | 7 | 5066.54 | 150 | 6 | <i>h</i> 2 <i>v</i> , <i>v</i> 2 <i>k</i> | 16.9, 16.3 | 16.6 | 11.89 | fair | 189 | +0.06 |
| 141 | 26 | 7 | 5077.54 | 150 | 6 | <i>vh</i> ± | 19.± | 19.± | 11.5 | poor | 200 | +0.2 |
| 142 | May 20 | 14 | 5160.83 | 40 | 6 | <i>b</i> 1 <i>v</i> , <i>v</i> 2-3 <i>d</i> | 38.0, 37.2 | 37.6 | 8.80 | fair | 2 | -0.07 |
| 143 | June 25 | 14 | 5196.83 | 40 | 6 | <i>c</i> 1-2 <i>v</i> , <i>v</i> 1 <i>l</i> | 32.1, 27.5 | 29.8 | 9.94 | good | 38 | +0.08 |
| 144 | July 30 | 10 | 5231.67 | 40 | 6 | <i>l</i> 5 <i>v</i> , <i>v</i> 4 <i>h</i> | 21.5, 22.9 | 22.2 | 11.07 | good | 72 | -0.30 |
| 145 | Aug. 26 | 8 | 5258.58 | 150 | 6 | <i>k</i> 2 <i>v</i> , limit <i>v</i> | 12.3 | 12.3 | 12.52 | fair | 99 | +0.15 |
| 146 | Sept. 15 | 7 | 5278.54 | 150 | 6 | <i>v</i> glimpsed, <i>k</i> 5 <i>v</i> | 9.± | 9.± | 13.0 | good | 119 | +0.27 |
| 147 | Oct. 10 | 7 | 5303.54 | 150 | 6 | <i>v</i> not seen, limit <i>l</i> < <i>k</i> .. | <13 | <13 | <12.4 | moon | 144 | .... |
| 148 | 18 | 11 | 5311.71 | 237 | 40 | <i>k</i> 4 <i>v</i> , <i>v</i> 2 <i>x</i> | 10.3, 12.0 | 11.2 | 12.67 | fair | 152 | -0.03 |
| 149 | Nov. 21 | 7 | 5345.54 | 150 | 6 | <i>h</i> 2 <i>v</i> , <i>v</i> 2 <i>k</i> , <i>l</i> 6-8 <i>v</i> | 16.9, 16.3, 19.5 .. | 17.2 | 11.79 | good | 186 | -0.14 |
| 150 | Dec. 11 | 7 | 5365.54 | 40 | 6 | <i>l</i> 3 <i>v</i> , <i>v</i> 8-10 <i>k</i> | 23.5, 23.3 | 23.4 | 10.88 | good | 206 | -0.13 |
| 151 | 29 | 6 | 5383.50 | 40 | 6 | <i>vl</i> | 26.5 | 26.5 | 10.42 | good | 224 | +0.39 |
| 152 | 1901 Feb. 9 | 9 | 5425.63 | 40 | 6 | <i>b</i> <i>v</i> , <i>v</i> 4-5 <i>d</i> , <i>v</i> 6 <i>e</i> | 39.0, 39.2, 39.6 .. | 39.3 | 8.57 | fair | 266 | -0.02 |
| 153 | 1903 Feb. 16 | .. | 6162. | .. | 24 | photograph ..... | .... | .... | 13.2± | .... | 157 | .... |
| 154 | 24 | 8 | 6170.58 | 67 | 12 | <i>x</i> 2 <i>v</i> , limit <i>v</i> | 8.0 | 8.0 | 13.17 | good | 165 | +0.67 |
| 155 | Oct. 11 | 8 | 6399.58 | 150 | 6 | <i>k</i> 4 <i>v</i> , limit <i>v</i> | 10.3 | 10.3 | 12.81 | good | 112 | +0.04 |
| 156 | 13 | .. | 6401. | .. | .. | .... | .... | .... | .... | .... | ... | .... |
| 157 | 1904 Aug. 29 | 8 | 6722.58 | 150 | 6 | <i>v</i> not seen, limit 6< <i>h</i> ... | <13 | <13 | <12.4 | poor | 153 | .... |
| 158 | Sept. 11 | 10 | 6735.67 | 67 | 12 | <i>v</i> not seen, limit 3< <i>x</i> ... | <7.0 | <7.0 | <13.3 | good | 166 | .... |
| 159 | Oct. 6 | .. | 6760. | .. | 6 | <i>v</i> not seen, limit <i>x</i> | <10 | <10 | <12.9 | good | 191 | .... |
| 160 | 27 | 8 | 6781.58 | 40 | 6 | <i>k</i> 0-1 <i>v</i> , <i>v</i> 3 <i>x</i> | 13.8, 13.0 | 13.4 | 12.36 | fine | 212 | +1.65 |
| 161 | 30 | 6 | 6784.50 | 40 | 6 | <i>v</i> <i>k</i> , <i>v</i> 3 <i>x</i> | 14.3, 13.0 | 13.6 | 12.34 | good | 215 | +1.78 |
| 162 | 30 | 6 | 6784.50 | 460 | 40 | <i>k</i> <i>v</i> , <i>v</i> 3 <i>x</i> | 14.3, 13.0 | 13.6 | 12.34 | good | 216 | +1.40 |
| 163 | 31 | 7 | 6785.54 | 67 | 12 | photometer ..... | .... | .... | 11.89 | good | 216 | +1.53 |
| 164 | Nov. 1 | 6 | 6786.50 | 67 | 12 | photometer ..... | .... | .... | 12.02 | good | 216 | +1.53 |
| 165 | 2 | 7 | 6787.54 | 67 | 12 | photometer ..... | .... | .... | 11.84 | fair | 217 | +1.38 |
| 166 | 14 | .. | 6799. | .. | 12 | photographs ..... | .... | .... | 11.3± | .... | 230 | .... |
| 167 | 29 | 6 | 6814.50 | 40 | 6 | photometer ..... | .... | .... | 10.45 | fair | 245 | +1.87 |
| 168 | 1905 Jan. 14 | 9 | 6860.63 | 237 | 40 | photometer ..... | .... | .... | 8.42 | fair | 9 | -0.58 |
| 169 | 28 | 8 | 6874.58 | 237 | 40 | photometer ..... | .... | .... | 8.58 | good | 23 | -0.85 |
| 170 | Feb. 25 | 7 | 6902.54 | 237 | 40 | photometer ..... | .... | .... | 9.69 | good | 51 | -0.82 |
| 171 | Mar. 3 | 7 | 6908.54 | 67 | 12 | <i>e</i> 5 <i>v</i> , <i>v</i> 3-4 <i>l</i> | 25.7, 30.0 | 27.9 | 10.11 | fair | 57 | -0.59 |
| 172 | May 22 | 15 | 6988.88 | 250 | 40 | <i>k</i> 8 <i>v</i> , <i>v</i> 2 <i>x</i> | 6.3, 12.0 | 10.9 | 12.70 | moon | 137 | -0.08 |
| 173 | June 10 | 15 | 7007.88 | 237 | 40 | <i>x</i> 1 <i>v</i> , <i>v</i> 1 <i>u</i> , <i>v</i> 2 <i>w</i> | 9.0, (13.15, 13.38). | .... | 13.18 | fair | 156 | +0.51 |
| 174 | 27 | 15 | 7024.88 | 237 | 40 | <i>vx</i> | 10.0 | 10.0 | 12.86 | fair | 173 | +0.52 |
| 175 | July 30 | 12 | 7057.75 | 237 | 40 | <i>v</i> 2 <i>k</i> | 16.3 | 16.3 | 11.87 | good | 206 | +0.86 |
| 176 | Aug. 9 | 14 | 7067.83 | 150 | 6 | <i>l</i> 8-10 <i>v</i> , <i>v</i> 6 <i>k</i> , <i>v</i> 4 <i>h</i> | (15.5), 20.3, 22.9 | 21.6 | 11.14 | good | 216 | +0.65 |
| 177 | 28 | 9 | 7086.63 | 150 | 6 | <i>v</i> 8 <i>k</i> , <i>v</i> 7 <i>t</i> , <i>v</i> 3 <i>m</i> , <i>l</i> 5 <i>v</i> | 22.3, 19.3, 23.5, 21.5 | 22.2 | 11.04 | fair | 235 | +1.64 |
| 178 | Sept. 17 | 8 | 7106.58 | 150 | 6 | <i>e</i> 1-2 <i>v</i> , <i>d</i> 1 <i>v</i> | 29.2, 33.7 | 31.4 | 9.68 | poor | 255 | +1.15 |
| 179 | Oct. 20 | 8 | 7139.58 | 80 | 12 | <i>va</i> | 42.0 | 42.0 | 8.12 | good | 6 | -0.78 |
| 180 | Nov. 21 | 6 | 7171.50 | 150 | 6 | <i>a</i> 6 <i>v</i> , <i>b</i> <i>v</i> , <i>v</i> 4 <i>d</i> | 36.0, 39.0, 38.7 .. | 38.2 | 8.70 | good | 38 | -1.30 |

The whole time covered by the observations, starting from the first, was divided into parts corresponding in length with the star's assumed period. The quantity t in the twelfth column is the time elapsed in days since the beginning of each of these parts. The last column, " Δ Mag," gives the residual between the observed magnitude and the reading from the mean light-curve corresponding to the time t .

Table 12 gives the data for finding the mean light-curve, following the form used by Turner in his reductions of the Rousdon variable star observations¹ with some additions. Dividing the assumed period, 282 days, into twelve parts we have in this case 23.5 day groups. The heading of Table 12 gives in two lines the number of the group and the day number corresponding to the last

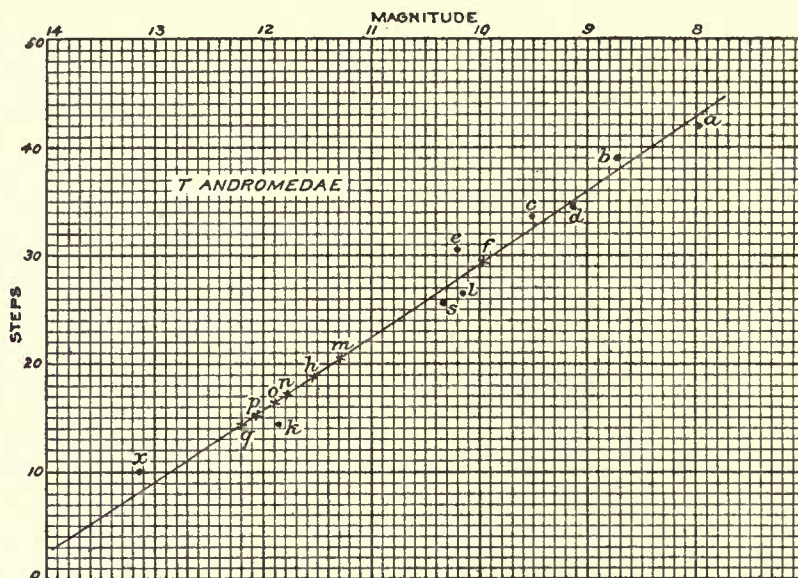


FIG. 4.—MAGNITUDE-CURVE FOR T ANDROMEDÆ.

day of the group. The first column gives the Julian day of the beginning of each period, starting from an arbitrary date, the first observation. Then follow for each group of each period, the mean t and magnitude in the Harvard system (found by averaging the quantities in the last two columns of Table 11 for the interval covered by the group) ΔM , the difference between the mean magnitude and the reading from the mean light-curve for the time t , and the number of nights' observations in the group. Finally, at the foot of the table will be found the general means of the tabulated quantities t , M and ΔM , followed by the total number of observations in each group. These general means of t and M are platted to form the mean light-curve (fig. 6, page 27).

¹ Memoirs of the Royal Astronomical Society, vol. 55, lix *et seq.*

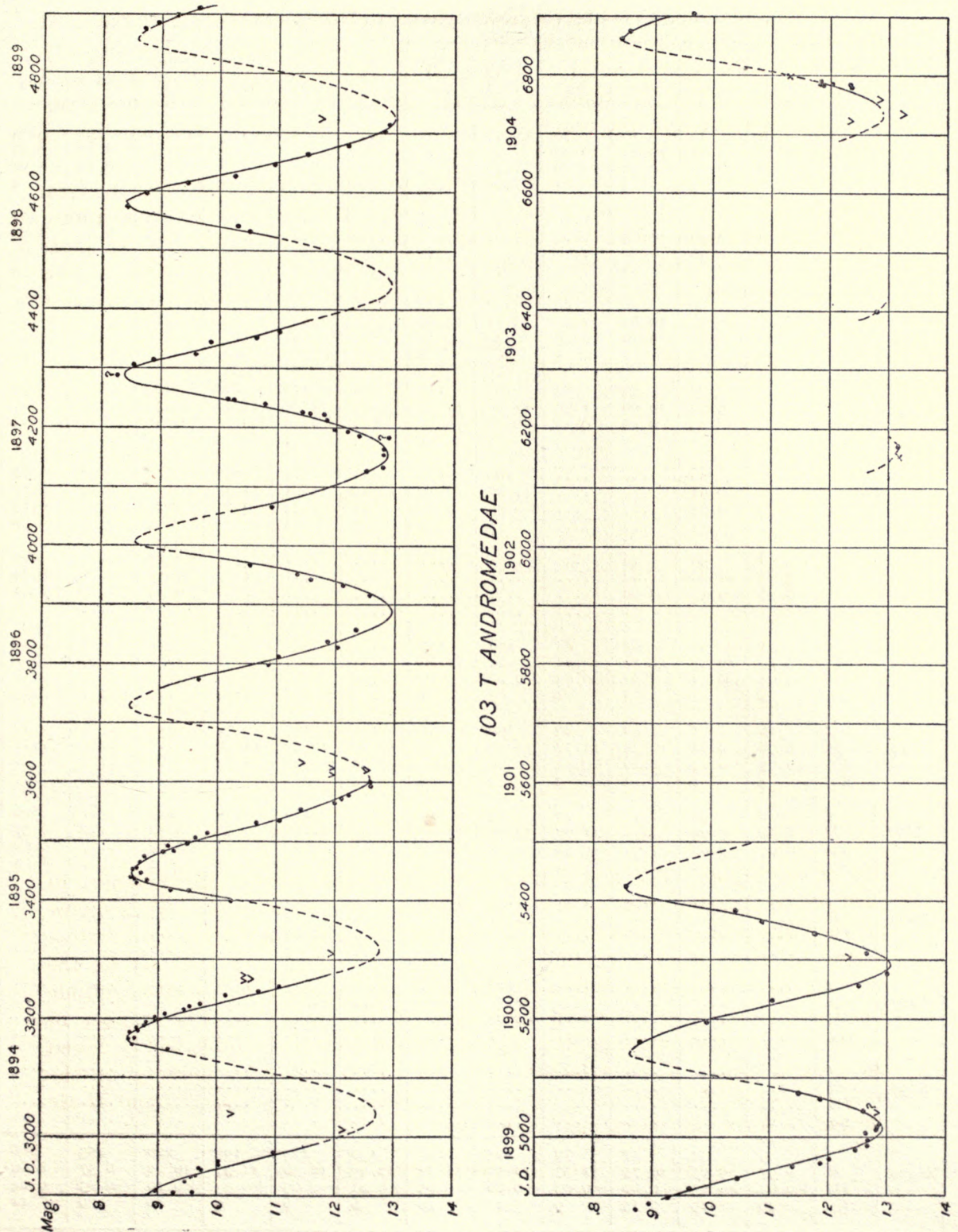


FIG. 5.—LIGHT-CURVE OF T ANDROMEDÆ.

TABLE 12.—MEAN MAGNITUDES FROM 23.5 DAY GROUPS.

| Group No.... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D..... | 23.5 | 47 | 70.5 | 94 | 117.5 | 141 | 164.5 | 188 | 211.5 | 235 | 258.5 | 282 |
| 2903 { | <i>t</i> | 9 | 35 | 50 | 70 | .... | .... | .... | .... | .... | 251 | 274 |
| | <i>M</i> | 9.33 | 9.67 | 10.02 | 10.99 | .... | .... | .... | .... | .... | 8.77 | 8.61 |
| | ΔM | +0.35 | -0.26 | -0.50 | -0.30 | .... | .... | .... | .... | .... | +0.15 | -0.08 |
| | No. | 4 | 4 | 2 | 1 | .... | .... | .... | .... | .... | 4 | 4 |
| 3185 { | <i>t</i> | 14 | 33 | 62 | .... | .... | .... | .... | .... | 223 | 250 | 269 |
| | <i>M</i> | 8.88 | 9.46 | 10.64 | .... | .... | .... | .... | .... | 9.66 | 8.65 | 8.66 |
| | ΔM | -0.18 | -0.36 | -0.30 | .... | .... | .... | .... | .... | -0.28 | +0.01 | +0.03 |
| | No. | 4 | 4 | 3 | .... | .... | .... | .... | .... | 4 | 4 | 4 |
| 3467 { | <i>t</i> | 12 | 36 | 66 | 86 | 105 | 130 | .... | .... | .... | .... | .... |
| | <i>M</i> | 8.88 | 9.54 | 10.86 | 11.42 | 12.11 | 12.60 | .... | .... | .... | .... | .... |
| | ΔM | -0.22 | -0.39 | -0.26 | -0.47 | -0.40 | -0.20 | .... | .... | .... | .... | .... |
| | No. | 4 | 4 | 2 | 1 | 3 | 2 | .... | .... | .... | .... | .... |
| 3749 { | <i>t</i> | .... | 26 | 56 | 84 | 108 | 141 | .... | 175 | 200 | 220 | .... |
| | <i>M</i> | .... | 9.70 | 10.96 | 11.96 | 12.27 | 12.97 | .... | 12.36 | 11.48 | 10.56 | .... |
| | ΔM | .... | +0.15 | +0.26 | +0.22 | -0.22 | +0.17 | .... | +0.08 | +0.16 | +0.31 | .... |
| | No. | .... | 1 | 2 | 2 | 1 | 1 | .... | 1 | 2 | 1 | .... |
| 4031 { | <i>t</i> | .... | 39 | .... | .... | 100 | 130 | 157 | 174 | 196 | 216 | 257 |
| | <i>M</i> | .... | 10.91 | .... | .... | 12.86 | 12.30 | 12.52 | 11.91 | 11.41 | 10.22 | 8.28 |
| | ΔM | .... | +0.84 | .... | .... | +0.26 | 0.00 | -0.12 | -0.42 | -0.05 | -0.24 | -0.24 |
| | No. | .... | 1 | .... | .... | 2 | 2 | 3 | 2 | 4 | 2 | 1 |
| 4313 { | <i>t</i> | 6 | 36 | 49 | .... | .... | .... | .... | .... | 2.23 | .... | 261 |
| | <i>M</i> | 9.25 | 10.26 | 11.02 | .... | .... | .... | .... | .... | 10.42 | .... | 8.54 |
| | ΔM | +0.28 | +0.32 | +0.60 | .... | .... | .... | .... | .... | +0.33 | .... | +0.01 |
| | No. | 2 | 2 | 1 | .... | .... | .... | .... | .... | 2 | .... | 1 |
| 4595 { | <i>t</i> | 11 | 32 | 61 | 84 | 106 | 119 | .... | .... | .... | .... | .... |
| | <i>M</i> | 9.12 | 10.27 | 11.21 | 12.28 | 12.81 | 12.89 | .... | .... | .... | .... | .... |
| | ΔM | +0.04 | +0.47 | +0.32 | +0.43 | +0.28 | +0.16 | .... | .... | .... | .... | .... |
| | No. | 2 | 1 | 3 | .... | 1 | 1 | .... | .... | .... | .... | .... |
| 4877 { | <i>t</i> | 10 | 1 | 56 | 80 | 106 | 128 | 142 | 167 | 194 | .... | .... |
| | <i>M</i> | 8.98 | 9.64 | 10.55 | 11.77 | 12.58 | 12.72 | 12.88 | 12.59 | 11.70 | .... | .... |
| | ΔM | -0.05 | -0.23 | -0.16 | +0.11 | +0.06 | -0.06 | +0.08 | +0.16 | +0.13 | .... | .... |
| | No. | 3 | 1 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | .... | .... |
| 5159 { | <i>t</i> | 2 | 38 | .... | 72 | 99 | 119 | 152 | 186 | 206 | 224 | .... |
| | <i>M</i> | 8.80 | 9.94 | .... | 11.07 | 12.52 | 13.0± | 12.67 | 11.79 | 10.88 | 10.42 | .... |
| | ΔM | -0.07 | -0.08 | .... | -0.30 | +0.15 | +0.27 | -0.03 | -0.17 | -0.13 | +0.39 | -0.02 |
| | No. | 1 | 1 | .... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6005 { | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | 165 | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | 13.17 | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | +0.67 | .... | .... | .... |
| | No. | .... | .... | .... | .... | .... | .... | .... | 1 | .... | .... | .... |
| 6287 { | <i>t</i> | .... | .... | .... | .... | 112 | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | 12.81 | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | +0.04 | .... | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... | .... |
| 6851 { | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Means { | <i>t</i> | 9 | 34 | 57 | 79 | 105 | 128 | 150 | 173 | 199 | 220 | 253 |
| | <i>M</i> | 8.97 | 9.93 | 10.75 | 11.57 | 12.55 | 12.84 | 12.69 | 12.36 | 11.37 | 10.22 | 8.57 |
| | ΔM | +0.02 | +0.05 | 0.00 | -0.03 | +0.02 | +0.05 | +0.01 | -0.09 | +0.03 | +0.10 | -0.03 |
| | No. | 20 | 19 | 15 | 9 | 11 | 10 | 6 | 6 | 9 | 10 | 9 |

COMPLETE LIGHT-CURVE.

(Fig. 5, page 25.)

This is formed by plating the magnitudes (in the Harvard system) from Table 11, and indicating the limit of visibility when the variable was not seen by the point of the V-shaped character. A smooth curve drawn through the platted points shows the light changes of the variable. When the number of observations is insufficient to give an accurate curve, it is drawn with a broken line by the aid of the mean curve. The dates and magnitudes of maxima and minima given in Table 13 are taken from this light-curve. The correction to the ephemeris, given in the sixth column, is calculated from the elements at the head of the table, with the corrected period 284 days. The weight in the seventh column results from the number of observations combined with their symmetry with respect to the maximum or minimum. In case of a symmetrical distribution the weight is $\frac{3}{2}$ times the number. If the observations all lie on one side the weight is $\frac{1}{2}$ the number. In case the date of maximum or minimum depends on the mean curve, the letters "mc" are placed in the magnitude column.

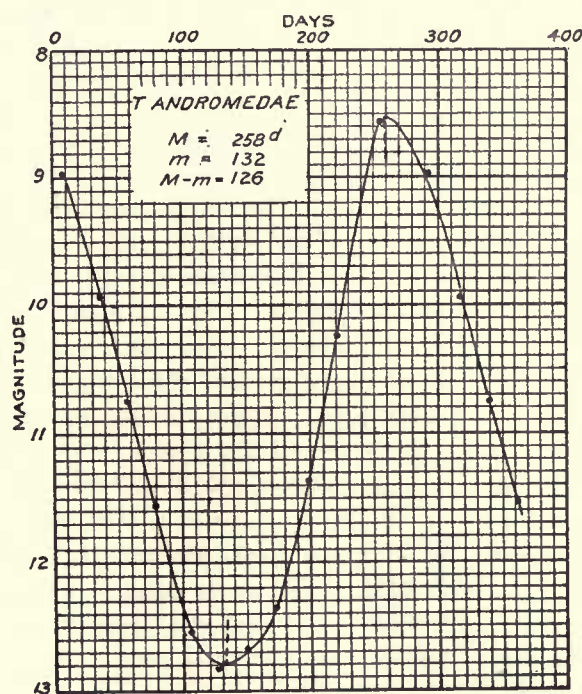


FIG. 6.—MEAN LIGHT-CURVE OF T ANDROMEDÆ.

TABLE 13.—103 T ANDROMEDÆ. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1894 Nov. 28 (J. D. 2413161) + 284^d × (E-51). M-m=126^d

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|------|------|-------|-----|---------|---------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 50 | 1894 Mar. 2 | 2890 | .... | mc | + 13 | 6 | 51 | 1894 July 26 | 3036 | .... | mc | + 1 | 2 |
| 51 | Dec. 3 | 3166 | 8.49 | 8.57 | + 5 | 24 | 52 | 1895 May 6 | 3320 | .... | mc | + 1 | 7 |
| 52 | 1895 Sept. 9 | 3446 | 8.58 | 8.66 | + 1 | 28 | 53 | 1896 Feb. 14 | 3604 | .... | mc | + 1 | 6 |
| 53 | 1896 June 13 | 3724 | .... | mc | - 5 | 2 | 54 | 1896 Nov. 24 | 3888 | 12.90 | 12.98 | + 1 | 15 |
| 54 | 1897 Mar. 21 | 4005 | .... | mc | - 8 | 3 | 55 | 1897 Aug. 16 | 4153 | 12.82 | 12.90 | - 18 | 17 |
| 55 | Dec. 31 | 4290 | 8.30 | 8.38 | - 7 | 13 | 56 | 1898 June 3 | 4444 | .... | mc | - 11 | 1 |
| 56 | 1898 Oct. 18 | 4581 | 8.32 | 8.40 | 0 | 10 | 57 | 1899 Mar. 11 | 4725 | 12.9 | 13.0 | - 14 | 4 |
| 57 | 1899 July 22 | 4858 | .... | mc | - 7 | 4 | 58 | Dec. 25 | 5014 | 12.90 | 12.98 | - 9 | 20 |
| 58 | 1900 Apr. 29 | 5139 | .... | 8.6 | - 10 | 7 | 59 | 1900 Sept. 28 | 5291 | 13.00 | 13.08 | - 16 | 10 |
| 59 | 1901 Feb. 2 | 5417 | .... | mc | - 16 | 2 | 62 | 1903 Feb. 14 | 6160 | 13.2 | 13.3 | + 1 | 1 |
| 64 | 1905 Jan. 14 | 6860 | .... | mc | + 7 | 2 | 64 | 1904 Sept. 6 | 6730 | .... | mc | + 3 | 5 |

TABLE 14.—PHOTOMETRIC MEASURES AND COLOR OF COMPARISON STARS.

| Star. | H. C. O. 37,151 | Lindemann +0.18 A. N. 139,345 | H. M. Parkhurst A. J. 15,77 | J. A. Parkhurst. | | Yendell, Visual A. J. 15,93 | Color, Plates 149 and 150 | Hagen. |
|----------|--------------------|-------------------------------------|-----------------------------------|------------------|-------|-----------------------------------|---------------------------------|--------|
| | | | | H. | P. | | | |
| <i>a</i> | 8.08 | 8.03 | 8.51 | 7.98 | 8.06 | 8.18 | +0.37 | 8.1 |
| <i>b</i> | 8.45 | 8.80 | 8.76 | 8.72 | 8.80 | 8.10 | -0.02 | 8.5 |
| <i>c</i> | ..... | ..... | ..... | 9.51 | 9.59 | 9.07 | -0.03 | 9.0 |
| <i>d</i> | 9.01 | 9.29 | 9.26 | 9.12 | 9.20 | 8.58 | +0.11 | 8.8 |
| <i>e</i> | ..... | ..... | ..... | 10.20 | 10.28 | 9.60 | -0.08 | 9.7 |
| <i>l</i> | ..... | ..... | ..... | 10.15 | 10.23 | 10.20 | +0.11 | 9.9 |
| <i>s</i> | 10.62 | ..... | ..... | 10.32 | 10.40 | ..... | +0.10 | 10.0 |
| <i>t</i> | 12.34 | ..... | ..... | 11.66 | 11.74 | ..... | +0.08 | 12.4 |
| <i>k</i> | 12.50 | ..... | 12.55 | 11.85 | 11.93 | ..... | -0.09 | 12.5 |
| <i>x</i> | 13.89 | ..... | ..... | 13.12 | 13.20 | ..... | ..... | ..... |
| <i>v</i> | ..... | ..... | ..... | ..... | ..... | ..... | +0.52 | ..... |

Table 14 collects the other photometric measures of these comparison stars which are known to the writer, adding Hagen's and Yendell's visual scales and the measure of the color from a comparison of photographs taken on ordinary and isochromatic plates. The Harvard results in the second column reveal a considerable difference in scale, but reference to the volume cited shows that the measures of the four faint stars depend on the single star *d*, which seems too narrow a foundation. Again, before any larger aperture had been used on the field, the writer selected the comparison star *x* with the 6-inch reflector, whose limit of vision, as determined by all the photometer measures, lies between 12.8 and 13.0. If this is true the Harvard values for the faint stars are numerically too large by at least three-quarters of a magnitude.

Lindemann's results were based on the magnitude 6.50 for the star B. D. + 26°23 (P. DM. 6.68) and are therefore increased by 0.18 to bring them to the Potsdam system. They show a very close agreement with my values in column P.

H. M. Parkhurst's measures make the yellow star *a* about half a magnitude fainter than the other values. The Purkinje phenomenon would seem to explain the difference, as he used an extinction photometer, while the others used the full light of the star. A difference in scale is also indicated by the single faint star *k*, but this is entitled to a relatively small weight as it depends on only two double extinctions, while the other stars have six to nine; and in other fields our scales are in good agreement.

The writer's results are given in columns H and P on both the Harvard and Potsdam scales.

Yendell's visual scale is added for comparison. The color of the star *a* probably accounts for his estimating it with a 4.25-inch aperture fainter than the star *b*.

The "Color" column gives the difference: Magnitude on ordinary plate *minus* magnitude on isochromatic plate. It will be noticed that these differences are within the combined accidental errors of the visual and photographic measures, except for the stars *a* and *v*. At the present writing the data are insufficient for expressing these color numbers on the usual decimal scale, but an idea of their

relation can be had from the coloration of the variable given by Yendell, 5.2, and by the Gesellschaft Committee on Variables, 6.0.

Besides that here given, three light-curves have been published for the variable near maximum. The curve first published by Pickering in *Astrophysical Journal*, 1, 305, 1895, was anomalous in character, consisting of two straight lines meeting at the point of maximum. This curve has unfortunately gained some publicity and been widely quoted, but seems to lack confirmation. Pickering's second curve in the same journal, 3, 281, is of a different character and agrees with that given by Yendell in *Astronomical Journal*, 15, 93, also with the curve here given. As far as known, no other complete light-curve has been published, as observations near minimum have been scarce. Those published by H. M. Parkhurst in the *Astronomical Journal*, vols. 15 and 17, for epochs 53 and 54, number 9 and 8, respectively. In Harvard Annals, 37, 206, the minimum of epoch 38 was observed by Reed, who gives seven observations when the variable was fainter than the eleventh magnitude.

The period 284 days satisfies the present set of observations better than the shorter period 281 days given by Chandler, Pickering, and the Gesellschaft committee, and demanded by the B. D. observations of 1855. Hagen gives in the catalogue sheet to the "Atlas" the elements of maximum:

$$1891 \text{ December } 14 (2081) + 274 \text{ E.}$$

This period is so much too short that the calculated maximum 17 falls at Julian day 6739, only nine days after the observed minimum.

We conclude that at present the period is lengthening.

CHAPTER III.

267 V ANDROMEDÆ.

R. A. $0^h 44^m 39.7^s$; Dec. $+35^\circ 6' 30''$ (1900).

The announcement of the discovery of this variable by Anderson was received in the *Astronomische Nachrichten*, 142, 159, in January, 1897. Observations began at once and the definitive notation was published by Chandler in *Astronomical Journal*, 17, 87, February, 1897. Some confusion arose from an apparent contradiction between the observations of Yendell and the writer (noted by Hartwig in the *Vierteljahrsschrift*, 32, 187), occasioned by a misidentification explained in *Astronomical Journal*, 8, 62. Some trouble may also arise from the fact that the Chandler number of the star is given as 268 in the *Nachrichten*, 160, 335, and in the *Harvard Provisional Catalogue of Variables*, Annals, 48, 96, whereas that number was assigned by Chandler to X Sculptoris in the *Journal*, 17, 88.

As Hartwig's observations of the star are not yet published, there are only available for comparison three isolated observations by Esch in the *Nachrichten*, 160, 335, the star being found invisible in February, 1902 (then 13^m by my curve) and 9.3^m , 1902 August 22.

The positions of the variable (relative to the star α , in Leyden A. G. Cat.) and the brighter comparison stars were measured with the 6-inch, the fainter stars with the 40-inch, and all positions were checked from the photograph.

The three fundamental magnitude stars (Table 15) are white, which perhaps accounts for the small residuals and the close agreement of the results with the Potsdam values.

The mean light-curve was formed from the observations up to February, 1905. It bears a close resemblance to that of T Andromedæ, the only difference being the length of the period. No halting in the regular change has been observed, but there is a range of more than a magnitude in the brightness at different maxima and half a magnitude at the minima. A pair of ordinary and isochromatic plates taken 1904 November 15, showed no color difference between the variable and the comparison stars d , e , and m .

The revised elements given by Chandler in *Astronomical Journal*, 18, 94,

$$\text{Max.} = 1896 \text{ Nov. } 5 \text{ (3869)} + 263 \text{ E}$$

as well as Hartwig's ephemeris in *Vierteljahrsschrift*, 39, 262, call for a maximum epoch 12, 1905 June 28. The observed date, May 5, though dependent on a small number of observations, does not seem liable to an error greater than 10 days, so that the Chandler period is evidently too long. The present set of observations are best satisfied by a period of 259 days, as given at the head of Table 23.

TABLE 15.—STANDARD MAGNITUDE STARS.

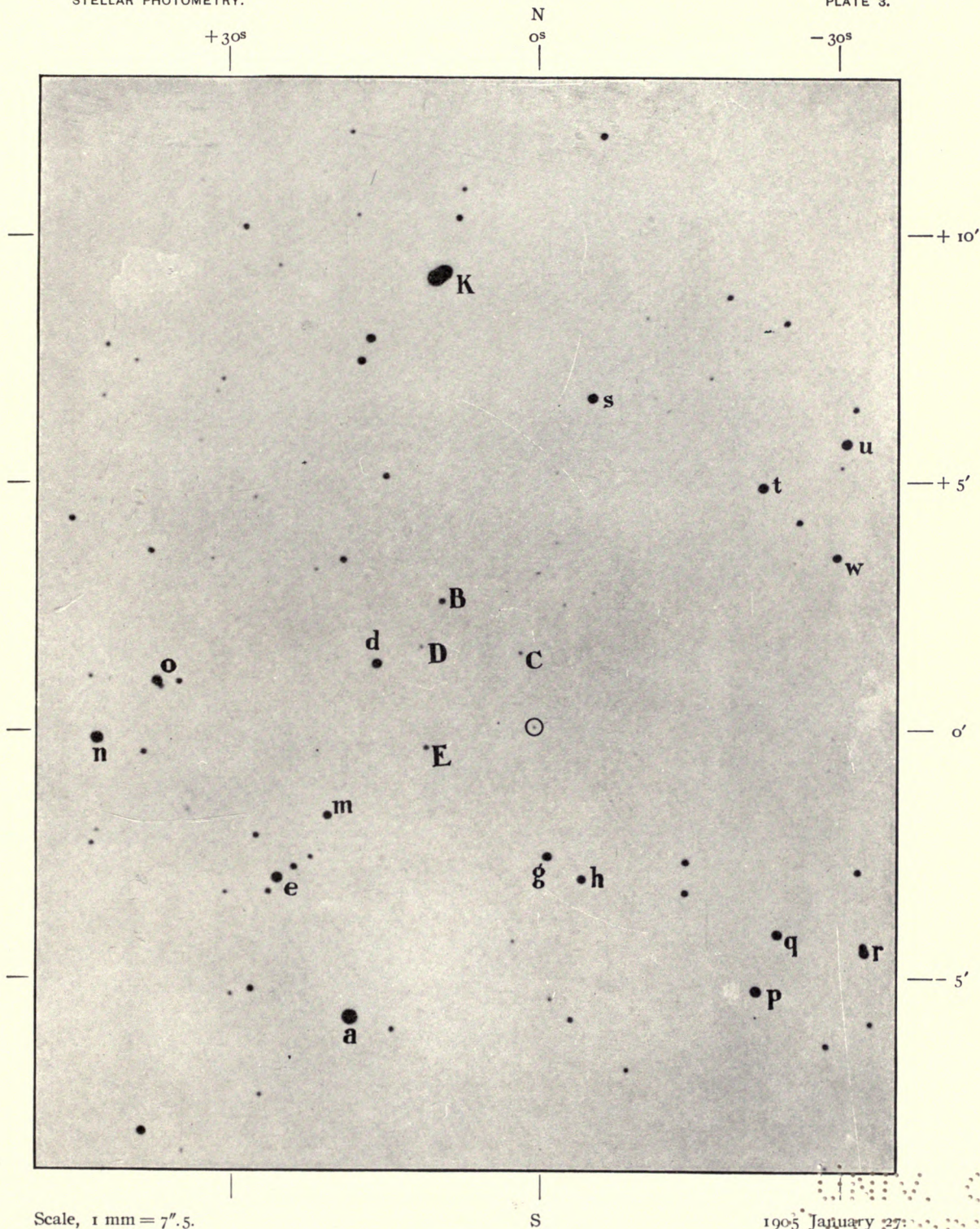
| Star. | B. D. No. | 1900. | | | Color. P. DM. | Magnitude. | | | | Residuals. | | | |
|-----------|-----------|-----------|-----------|-----------|------------------|------------|------------|----------|-----------|------------|------------|-----|-----------------------------|
| | | R. A. | | | | Dec. | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | | | H.C.O. | P. DM. | H. | P. | H. | P. | |
| | | <i>B'</i> | <i>E'</i> | <i>F'</i> | | <i>h</i> | <i>m</i> | <i>s</i> | <i>°</i> | <i>'</i> | | | |
| | ° | | | | | | | | | | | | |
| <i>B'</i> | + 35 146 | 0 | 42 | 34 | + 35 39.5 | W+ | 8.02 | 8.23 | 7.93 | 8.22 | — 9 | — 1 | ± 2 |
| <i>E'</i> | + 35 145 | 0 | 42 | 33 | + 35 56.6 | W+ | 7.80 | 8.03 | 7.74 | 8.03 | — 6 | 0 | ± 2 |
| <i>F'</i> | + 34 148 | 0 | 50 | 45 | + 34 40.9 | W | 6.82 | 7.26 | 6.98 | 7.27 | + 16 | + 1 | ± 2 |
| | Mean... | | | | | | 7.55 | 7.84 | 7.55 | 7.84 | ± 10 | ± 1 | ± 2 |

TABLE 16.—COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|----------|------|--------------|--------------|----------|----------|------|--------------|--------------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | <i>o</i> | | <i>h m s</i> | <i>o ' "</i> | | <i>o</i> | | <i>h m s</i> | <i>o ' "</i> |
| <i>y</i> | +34 120 | 9.0 | 0 41 36 | +34 38.5 | <i>l</i> | +34 131 | 9.2 | 0 43 22 | +34 55.7 |
| <i>z</i> | +34 121 | 8.4 | 0 42 6 | +34 32.5 | <i>E</i> | +34 132 | 9.1 | 0 43 24 | +34 45.7 |
| <i>a</i> | +34 126 | 9.1 | 0 42 31 | +34 45.9 | <i>A</i> | +35 154 | 8.9 | 0 43 24 | +35 3.6 |
| <i>b</i> | +34 127 | 8.3 | 0 42 46 | +34 39.0 | | | | | |

TABLE 17.—COMPARISON STARS FOR V ANDROMEDÆ (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|-----------|----------------------------|----------|----------|---------------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | <i>"</i> | <i>s</i> | <i>"</i> | | H. | P. | H. | P. |
| <i>y</i> | -442 | -36.0 | -777 | 41.5 | 9.27 | 9.56 | ..... | ..... |
| <i>r</i> | -408 | -33.3 | -275 | ..... | ..... | ..... | 12± | ..... |
| <i>u</i> | -388 | -31.6 | +342 | 26.1 | ..... | ..... | 11.29 | 11.58 |
| <i>w</i> | -374 | -30.5 | +206 | 25.1 | ..... | ..... | 11.42 | 11.71 |
| <i>q</i> | -315 | -25.7 | -255 | ..... | ..... | ..... | 12± | ..... |
| <i>t</i> | -286 | -23.3 | +291 | 25.1 | ..... | ..... | 11.42 | 11.71 |
| <i>p</i> | -272 | -22.2 | -323 | ..... | ..... | ..... | 11.5± | ..... |
| <i>A</i> | -172 | -14.1 | -165 | 16.0 | ..... | ..... | 12.5 | 12.8 |
| <i>z</i> | -75 | -6.1 | -1156 | ..... | 8.23 | 8.52 | ..... | ..... |
| <i>s</i> | -68 | -5.5 | +396 | 23.1 | ..... | ..... | 11.68 | 11.97 |
| <i>h</i> | -53 | -4.3 | -187 | 17.7 | ..... | ..... | 12.34 | 12.63 |
| <i>g</i> | -12 | -1.0 | -156 | 20.4 | ..... | ..... | 12.00 | 12.29 |
| <i>C</i> | +16 | +1.3 | +90 | 4.7 | 13.82 | 14.11 | ..... | ..... |
| <i>B</i> | +115 | +9.4 | +152 | 11.5 | 13.04 | 13.33 | ..... | ..... |
| <i>k</i> | +119 | +9.7 | +547 | ..... | ..... | ..... | 9± | ..... |
| <i>E</i> | +132 | +10.8 | -26 | 9.1 | 13.46 | 13.75 | ..... | ..... |
| <i>D</i> | +139 | +11.3 | +96 | 0 | 14.26 | 14.55 | ..... | ..... |
| <i>d</i> | +194 | +15.8 | +74 | 23.0 | 11.83 | 12.12 | ..... | ..... |
| <i>f</i> | +224 | +18.3 | -748 | 31.1 | 10.41 | 10.70 | ..... | ..... |
| <i>a</i> | +235 | +19.2 | -354 | 37.4 | 9.91 | 10.20 | ..... | ..... |
| <i>m</i> | +258 | +21.0 | -107 | 20.9 | 12.24 | 12.53 | ..... | ..... |
| <i>e</i> | +325 | +26.5 | -185 | 26.5 | 11.26 | 11.55 | ..... | ..... |
| <i>b</i> | +423 | +34.5 | -765 | 44.6 | 8.81 | 9.10 | ..... | ..... |
| <i>o</i> | +473 | +38.5 | +51 | 23.9 | ..... | ..... | 11.58 | 11.87 |
| <i>n</i> | +549 | +44.7 | -15 | ..... | ..... | ..... | 11.17 | 11.46 |
| <i>l</i> | +846 | +68.9 | +296 | 41.4 | ..... | ..... | 9.32 | 9.61 |
| <i>A'</i> | +883 | +72.0 | +714 | 43.9 | ..... | ..... | 8.98 | 9.27 |



Scale, 1 mm = 7".5.

S

1905 January 27

267 V ANDROMEDÆ.

R. A. $0^h 44^m 39^s.7$. Dec. $+35^\circ 6' 30''$, 1900.

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 October 30. | | | 6-INCH. | | | | Good. | |
|--------------------|------------|----------------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 21 29 | 38 | <i>E'</i> | 12.8 13.6 13.1 | 13.17 | 13.99 | 0.77 | 7.71 | 8.00 |
| | | <i>B'</i> | 15.1 15.2 15.7 | 15.33 | 15.30 | 0.98 | 7.92 | 8.21 |
| | | <i>y</i> | 28.3 28.9 28.3 | 28.50 | 28.34 | 2.49 | 9.43 | 9.72 |
| | | <i>z</i> | 18.4 18.2 19.1 | 18.57 | 19.02 | 1.47 | 8.41 | 8.70 |
| | | <i>b</i> | 22.0 23.1 23.2 | 22.77 | 23.29 | 1.96 | 8.90 | 9.19 |
| | | <i>a</i> | 31.2 31.2 30.9 | 31.10 | 31.95 | 2.92 | 9.86 | 10.15 |
| | | <i>v</i> | 49.7 49.3 49.4 | 49.47 | ..... | 4.66 | 11.60 | 11.89 |
| | | <i>F'</i> | 5.5 6.1 6.1 | 5.90 | ..... | 0.02 | 6.96 | 7.25 |
| | | <i>F'_{a1}</i> | 14.9 14.1 14.1 | 14.37 | 14.24 | 0.83 | 7.77 | 8.06 |
| | | <i>F'_{a1}</i> | 13.7 14.3 14.3 | 14.10 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 32.8 32.9 32.7 | 32.80 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 24.1 23.1 24.2 | 23.80 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 19.7 18.9 19.8 | 19.47 | ..... | ..... | ..... | ..... |
| | | <i>y</i> | 28.0 28.2 28.3 | 28.17 | ..... | ..... | ..... | ..... |
| | | <i>B'</i> | 15.7 15.0 15.1 | 15.27 | ..... | ..... | ..... | ..... |
| 21 51 | 34 | <i>E'</i> | 15.0 14.8 14.6 | 14.80 | ..... | ..... | ..... | ..... |
| 1904 October 30. | | | Quiet, dull. | | | | | |
| 23 23 | 20 | <i>b</i> | 25.8 26.7 26.7 | 26.40 | 25.82 | 2.23 | 8.82 | 9.11 |
| | | <i>a</i> | 33.9 34.3 33.9 | 34.03 | 33.55 | 3.13 | 9.72 | 10.01 |
| | | <i>z</i> | 19.2 21.2 20.2 | 20.20 | 20.60 | 1.66 | 8.25 | 8.54 |
| | | <i>y</i> | 28.1 27.8 28.1 | 28.00 | 29.17 | 2.58 | 9.17 | 9.46 |
| | | <i>B'</i> | 18.1 17.9 17.8 | 17.93 | 18.15 | 1.37 | 7.96 | 8.25 |
| | | <i>E'</i> | 15.9 16.0 16.5 | 16.13 | 16.55 | 1.16 | 7.75 | 8.04 |
| | | <i>E'</i> | 17.1 16.7 17.1 | 16.97 | ..... | ..... | ..... | ..... |
| | | <i>B'</i> | 18.3 18.1 18.7 | 18.37 | ..... | ..... | ..... | ..... |
| | | <i>y</i> | 30.9 30.1 30.0 | 30.33 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 21.1 20.9 21.0 | 21.00 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 33.3 32.6 33.3 | 33.07 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 25.2 25.0 25.5 | 25.23 | ..... | ..... | ..... | ..... |
| | | <i>F'</i> | 11.1 11.0 11.1 | 11.07 | ..... | ..... | ..... | ..... |
| 23 41 | 18 | <i>F'</i> | 10.0 10.8 10.1 | 10.30 | 10.69 | 0.36 | 6.95 | 7.24 |
| 1904 September 11. | | | 12-INCH. | | | | Good. | |
| 21 8 | 42 | <i>y</i> | 17.8 17.6 17.1 | 17.50 | 17.30 | 1.38 | 9.28 | 9.57 |
| | | <i>z</i> | 9.8 9.7 8.7 | 9.40 | 9.25 | 0.36 | 8.26 | 8.55 |
| | | <i>f</i> | 27.8 27.0 28.1 | 27.63 | 28.48 | 2.50 | 10.40 | 10.69 |
| | | <i>b</i> | 13.1 13.2 14.0 | 13.43 | 14.00 | 0.92 | 8.82 | 9.11 |
| | | <i>a</i> | 24.1 23.8 24.1 | 24.00 | 23.47 | 2.06 | 9.96 | 10.25 |
| | | <i>e</i> | 34.9 35.2 35.8 | 35.30 | 36.02 | 3.32 | 11.22 | 11.51 |
| | | <i>m</i> | 44.1 44.3 44.0 | 44.13 | 44.03 | 4.22 | 12.12 | 12.41 |
| | | <i>d</i> | 40.9 40.7 41.2 | 40.93 | 39.70 | 3.75 | 11.65 | 11.94 |
| | | <i>v</i> | 25.7 25.0 25.5 | 25.40 | ..... | 2.24 | 10.14 | 10.43 |
| | | <i>d</i> | 37.9 39.2 38.3 | 38.47 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 43.3 44.1 44.4 | 43.93 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 36.1 37.3 36.8 | 36.73 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 23.0 23.1 22.7 | 22.93 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 14.7 14.3 14.7 | 14.57 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 29.2 29.4 29.4 | 29.33 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 8.6 9.7 9.0 | 9.10 | ..... | ..... | ..... | ..... |
| 21 29 | 38 | <i>y</i> | 17.1 16.8 17.4 | 17.10 | ..... | ..... | ..... | ..... |

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 October 30. | | | 12-INCH. | | | | Good. | |
|------------------|------------|----------|-----------------|----------------------|------------|-------|---------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 22 30 | 27 | <i>y</i> | 15.8 16.3 16.0 | 15.03 | 14.75 | 1.02 | 9.14 | 9.43 |
| | | <i>z</i> | 7.8 8.1 8.7 | 8.20 | 7.52 | 0.21 | 8.33 | 8.62 |
| | | <i>b</i> | 12.4 13.1 13.1 | 12.87 | 12.64 | 0.75 | 8.87 | 9.16 |
| | | <i>f</i> | 24.8 25.8 24.0 | 24.87 | 25.90 | 2.27 | 10.39 | 10.68 |
| | | <i>a</i> | 20.0 20.0 20.0 | 20.00 | 21.24 | 1.85 | 9.97 | 10.26 |
| | | <i>e</i> | 35.0 35.1 34.8 | 34.97 | 33.82 | 3.06 | 11.18 | 11.47 |
| | | <i>m</i> | 41.7 42.0 42.0 | 41.90 | 41.80 | 3.98 | 12.10 | 12.39 |
| | | <i>d</i> | 37.8 39.1 39.2 | 38.70 | 38.75 | 3.63 | 11.75 | 12.04 |
| | | <i>v</i> | 33.0 33.9 33.8 | 33.57 | ..... | 3.03 | 11.15 | 11.44 |
| | | <i>d</i> | 38.7 38.5 39.2 | 38.80 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 42.3 40.9 41.9 | 41.70 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 32.2 33.0 32.8 | 32.67 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 22.7 22.3 22.4 | 22.47 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 27.2 26.3 27.3 | 26.93 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 12.0 12.8 12.4 | 12.40 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 5.9 6.9 7.7 | 6.83 | ..... | ..... | ..... | ..... |
| 22 50 | 23 | <i>y</i> | 14.0 14.6 14.8 | 14.47 | ..... | ..... | ..... | ..... |
| 1904 November 1. | | | | | | | | |
| | | | | | | | Good. | |
| 21 15 | 40 | <i>y</i> | 23.1 23.9 23.7 | 23.57 | 24.14 | 2.12 | 9.28 | 9.57 |
| | | <i>z</i> | 16.2 15.9 15.0 | 15.70 | 15.45 | 1.11 | 8.27 | 8.56 |
| | | <i>b</i> | 21.8 21.3 20.7 | 21.27 | 20.55 | 1.77 | 8.93 | 9.22 |
| | | <i>f</i> | 35.1 35.9 34.3 | 35.10 | 35.67 | 3.27 | 10.43 | 10.72 |
| | | <i>a</i> | 30.2 29.8 29.8 | 29.93 | 30.25 | 2.68 | 9.84 | 10.13 |
| | | <i>e</i> | 43.6 44.2 43.9 | 43.90 | 43.62 | 4.17 | 11.33 | 11.62 |
| | | <i>d</i> | 52.3 52.9 52.3 | 52.50 | 51.25 | 4.93 | 12.09 | 12.38 |
| | | <i>m</i> | 55.5 56.7 57.4 | 56.53 | 55.97 | 5.29 | 12.45 | 12.74 |
| | | <i>v</i> | 46.1 45.9 45.0 | 45.67 | ..... | 4.40 | 11.56 | 11.85 |
| | | <i>m</i> | 55.0 55.5 55.7 | 55.40 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 50.1 50.1 49.8 | 50.00 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 43.0 43.9 43.1 | 43.33 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 30.7 30.3 30.7 | 30.57 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 36.7 36.0 36.0 | 36.23 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 19.9 19.8 19.8 | 19.83 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 15.0 15.5 15.1 | 15.20 | ..... | ..... | ..... | ..... |
| 21 33 | 37 | <i>y</i> | 25.0 24.4 24.7 | 24.70 | ..... | ..... | ..... | ..... |
| 1904 November 2. | | | | | | | | |
| | | | | | | | Fair to good. | |
| 21 57 | 33 | <i>y</i> | 22.0 21.7 21.7 | 21.80 | 21.94 | 1.91 | 9.38 | 9.67 |
| | | <i>z</i> | 13.8 15.0 14.2 | 14.33 | 13.45 | 0.59 | 8.06 | 8.35 |
| | | <i>b</i> | 19.8 18.3 19.2 | 19.10 | 18.62 | 1.55 | 9.02 | 9.31 |
| | | <i>f</i> | 33.7 32.7 34.1 | 33.50 | 32.85 | 2.95 | 10.42 | 10.71 |
| | | <i>a</i> | 27.0 28.1 28.3 | 27.80 | 27.22 | 2.39 | 9.86 | 10.15 |
| | | <i>e</i> | 42.9 41.7 41.8 | 42.13 | 41.27 | 3.92 | 11.39 | 11.68 |
| | | <i>m</i> | 51.4 51.2 51.0 | 51.20 | 51.17 | 4.92 | 12.39 | 12.68 |
| | | <i>d</i> | 46.5 46.3 46.6 | 46.47 | 46.47 | 4.46 | 11.93 | 12.22 |
| | | <i>v</i> | 39.3 40.8 40.2 | 40.10 | ..... | 3.80 | 11.27 | 11.56 |
| | | <i>d</i> | 46.5 46.9 46.0 | 46.47 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 50.9 51.2 51.3 | 51.13 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 40.0 41.2 40.0 | 40.40 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 26.1 27.0 26.8 | 26.63 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 32.5 31.8 32.3 | 32.20 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 17.7 18.1 18.6 | 18.13 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 11.9 12.8 13.0 | 12.57 | ..... | ..... | ..... | ..... |
| 22 18 | 29 | <i>y</i> | 21.7 22.2 22.3 | 22.07 | ..... | ..... | ..... | ..... |

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1902 February 12. | | | 40-INCH. | | | | Fair to good. | |
|-------------------|------------|-----------------------|------------------|----------------------|------------|-------|---------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | ° | <i>e</i> | 17.5 18.0 19.0 | 18.17 | 17.09 | 1.35 | 11.42 | 11.71 |
| | | <i>m</i> | 24.8 25.2 25.0 | 25.00 | 24.39 | 2.15 | 12.22 | 12.51 |
| | | <i>d</i> | 19.2 20.0 19.3 | 19.50 | 19.97 | 1.69 | 11.76 | 12.05 |
| | | <i>D</i> | 38.8 39.7 40.1 | 39.53 | ..... | 3.72 | 13.79 | 14.08 |
| | | <i>B</i> | 31.8 32.8 32.0 | 32.20 | ..... | 2.88 | 12.95 | 13.24 |
| | | <i>C</i> | 37.1 38.2 37.0 | 37.43 | ..... | 3.48 | 13.55 | 13.84 |
| | | <i>v</i> | 30.8 32.3 32.0 | 31.70 | ..... | 2.83 | 12.90 | 13.19 |
| | | <i>E</i> | 35.0 35.3 34.8 | 35.03 | ..... | 3.20 | 13.27 | 13.56 |
| | | <i>d</i> | 19.5 21.8 20.0 | 20.43 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 23.2 24.4 23.7 | 23.77 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 16.0 15.9 16.1 | 16.00 | ..... | ..... | ..... | ..... |
| | | <i>e_{a2}</i> | 27.2 28.1 27.2 | 27.50 | ..... | 2.42 | ..... | ..... |
| | | <i>d_{a1}</i> | 32.8 31.7 33.8 | 32.77 | ..... | 2.95 | ..... | ..... |
| 4 42 | | | | | | | | |
| 1902 December 26. | | | Clear, unsteady. | | | | | |
| 2 45 | | <i>e</i> | 21.4 22.8 22.5 | 22.23 | 23.78 | 2.10 | 11.17 | 11.46 |
| | | <i>m</i> | 36.4 35.8 35.8 | 36.00 | 36.10 | 3.32 | 12.39 | 12.68 |
| | | <i>d</i> | 29.9 30.9 31.0 | 30.60 | 31.27 | 2.78 | 11.85 | 12.14 |
| | | <i>D</i> | 58.7 57.2 58.2 | 58.03 | 56.93 | 5.34 | 14.41 | 14.70 |
| | | <i>B</i> | 42.2 43.6 44.6 | 43.47 | 44.54 | 4.28 | 13.35 | 13.64 |
| | | <i>C</i> | 52.5 53.3 53.7 | 53.17 | 53.89 | 5.15 | 14.22 | 14.51 |
| | | <i>v</i> | 47.2 45.2 48.2 | 46.87 | ..... | 4.50 | 13.57 | 13.86 |
| | | <i>E</i> | 49.9 49.8 49.7 | 49.80 | 49.99 | 4.80 | 13.87 | 14.16 |
| | | <i>E</i> | 49.9 50.8 49.8 | 50.17 | ..... | ..... | ..... | ..... |
| | | <i>C</i> | 54.2 53.8 55.8 | 54.60 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 45.8 45.2 45.8 | 45.60 | ..... | ..... | ..... | ..... |
| | | <i>D</i> | 54.7 55.7 57.2 | 55.83 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 31.3 32.8 31.7 | 31.93 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 35.4 36.2 37.0 | 36.20 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 25.0 26.0 25.0 | 25.33 | ..... | ..... | ..... | ..... |
| 3 25 | | <i>e_{a2}</i> | 39.8 40.7 40.2 | 40.23 | ..... | 3.80 | ..... | ..... |
| 1905 January 28. | | | Good. | | | | | |
| 4 55 | 49 | <i>e</i> | 18.3 19.8 20.0 | 19.37 | 18.44 | 1.50 | 11.53 | 11.82 |
| | | <i>m</i> | 24.0 24.5 24.4 | 24.30 | 23.08 | 2.04 | 12.07 | 12.36 |
| | | <i>d</i> | 21.9 22.2 22.8 | 22.30 | 20.62 | 1.78 | 11.81 | 12.10 |
| | | <i>B</i> | 34.6 33.2 34.2 | 34.00 | 33.16 | 3.00 | 13.03 | 13.32 |
| | | <i>D</i> | 44.1 45.1 45.8 | 45.00 | 44.76 | 4.30 | 14.33 | 14.62 |
| | | <i>E</i> | 37.8 38.8 37.3 | 37.97 | 36.22 | 3.33 | 13.36 | 13.65 |
| | | <i>v</i> | 35.0 37.0 36.0 | 36.00 | 36.18 | 3.33 | 13.36 | 13.65 |
| | | <i>C</i> | 40.2 40.8 40.7 | 40.57 | 40.34 | 3.81 | 13.84 | 14.13 |
| | | <i>C</i> | 40.1 40.3 39.9 | 40.10 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 37.7 36.0 36.0 | 36.57 | ..... | ..... | ..... | ..... |
| | | <i>E</i> | 34.1 34.1 35.2 | 34.47 | ..... | ..... | ..... | ..... |
| | | <i>D</i> | 43.9 44.5 45.2 | 44.53 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 34.2 32.0 31.8 | 32.33 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 19.0 18.7 19.1 | 18.93 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 22.5 21.8 21.3 | 21.87 | ..... | ..... | ..... | ..... |
| 5 17 | 53 | <i>e</i> | 17.2 17.8 17.5 | 17.50 | ..... | ..... | ..... | ..... |

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1905 January 31. | | | | 40-INCH. | | Good. | | |
|------------------|------------|----------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | <i>e</i> | 26.1 27.2 26.4 | 26.57 | 24.30 | 2.14 | 11.55 | 11.84 |
| 4 50 | 50 | <i>m</i> | 33.0 33.1 33.0 | 33.03 | 30.93 | 2.75 | 12.16 | 12.45 |
| | | <i>d</i> | 27.2 28.0 27.7 | 27.63 | 25.76 | 2.27 | 11.68 | 11.97 |
| | | <i>B</i> | 39.8 40.1 40.4 | 40.10 | 38.40 | 3.59 | 13.00 | 13.29 |
| | | <i>D</i> | 52.2 53.7 52.8 | 52.90 | 52.00 | 4.99 | 14.40 | 14.69 |
| | | <i>E</i> | 44.0 44.3 44.0 | 44.10 | 43.00 | 4.11 | 13.52 | 13.81 |
| | | <i>v</i> | 40.8 41.8 41.7 | 41.43 | 41.52 | 3.95 | 13.36 | 13.65 |
| | | <i>C</i> | 44.8 46.9 45.9 | 45.87 | 45.50 | 4.38 | 13.79 | 14.08 |
| | | <i>C</i> | 45.6 44.8 45.0 | 45.13 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 41.7 41.6 41.5 | 41.60 | ..... | ..... | ..... | ..... |
| | | <i>E</i> | 42.4 41.4 41.9 | 41.90 | ..... | ..... | ..... | ..... |
| | | <i>D</i> | 52.2 52.6 51.5 | 51.10 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 36.0 37.9 36.2 | 36.70 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 23.7 24.3 23.7 | 23.90 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 28.8 27.7 30.0 | 28.83 | ..... | ..... | ..... | ..... |
| 5 04 | 52 | <i>e</i> | 21.6 21.8 22.7 | 22.03 | ..... | ..... | ..... | ..... |

TABLE 19.—267 V ANDROMEDÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|---------|-----------------|-----------|------|--------|------|------------------|-----------|------|--------|------|------------------|-----------|------|--------|------|
| Star. | 1904 October 6. | | | | | 1904 October 30. | | | | | 1904 October 30. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| B'..... | 0.77 | 7.91 | 8.20 | -.11 | -.03 | 0.98 | 7.92 | 8.21 | -.10 | -.02 | 1.37 | 7.96 | 8.25 | -.06 | +.02 |
| E'..... | 0.63 | 7.77 | 8.06 | -.03 | +.03 | 0.77 | 7.71 | 8.00 | -.09 | -.03 | 1.16 | 7.75 | 8.04 | -.05 | +.01 |
| F'..... | 0.18 | 6.96 | 7.25 | +.14 | -.01 | 0.08 | 7.02 | 7.31 | +.20 | +.06 | 0.36 | 6.95 | 7.24 | +.13 | -.02 |
| Means.. | 0.41 | 7.55 | 7.84 | ±.09 | ±.02 | 0.61 | 7.55 | 7.84 | ±.13 | ±.04 | 0.96 | 7.55 | 7.84 | ±.08 | ±.02 |
| M..... | .... | 7.14 | 7.43 | .... | .... | .... | 6.94 | 7.23 | .... | .... | .... | 6.59 | 6.88 | .... | .... |

| 12-INCH. | | | | | | 40-INCH. | | | | | |
|-----------|--------------|----------|--------|---------|---------|-----------|---------------|----------|----------|----------|---------|
| Star. | Mag. 6-inch. | C. | | | | Star. | Mag. 12-inch. | C. | | | |
| | | Sept 11. | Oct 30 | Nov. 1. | Nov. 2. | | | Feb. 12. | Dec. 26. | Jan. 28. | Jan. 31 |
| a..... | 9.75 | 2.06 | 1.85 | 2.68 | 2.39 | d..... | 11.85 | 1.69 | 2.78 | 1.78 | 2.27 |
| b..... | 8.87 | 0.92 | 0.75 | 1.77 | 1.55 | e..... | 11.28 | 1.35 | 2.10 | 1.50 | 2.14 |
| y..... | 9.29 | 1.38 | 1.02 | 2.12 | 1.91 | m..... | 12.26 | 2.15 | 3.32 | 2.04 | 2.75 |
| z..... | 8.41 | 0.36 | 0.21 | 1.11 | 0.59 | | | | | | |
| Mean C .. | .... | 1.18 | 0.96 | 1.92 | 1.61 | Mean C .. | .... | 1.73 | 2.73 | 1.77 | 2.39 |
| Mean Mag. | 9.08 | 9.08 | 9.08 | 9.08 | 9.08 | Mean Mag. | 11.80 | 11.80 | 11.80 | 11.80 | 11.80 |
| M..... | .... | 7.90 | 8.12 | 7.16 | 7.47 | M..... | .... | 10.07 | 9.07 | 10.03 | 9.41 |

TABLE 20.—267 V ANDROMEDÆ. MEAN MAGNITUDES.

| 6-INCH. | | | | | | | | | | | |
|---------------|---------------|---------------|--------------|---------------|-------------|---------------|-------------|---------------|---------|---------|---------------|
| Star. | October 6. | | October 30. | | October 30. | | Mag. | Δ Mag. | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | | | Mag. H. | Mag. P. | Δ Mag. |
| <i>B'</i> ... | 7.91 | -0.02 | 7.92 | -0.01 | 7.96 | +0.03 | .... | .... | 7.93 | 8.22 | ± 0.02 |
| <i>E'</i> ... | 7.77 | +0.03 | 7.71 | -0.03 | 7.75 | +0.01 | .... | .... | 7.74 | 8.03 | ± 0.02 |
| <i>F'</i> ... | 6.96 | -0.02 | 7.02 | +0.04 | 6.95 | -0.03 | .... | .... | 6.98 | 7.27 | ± 0.02 |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7.55 | 7.84 | ± 0.02 |
| <i>a</i> | 9.66 | -0.09 | 9.86 | +0.11 | 9.72 | -0.03 | .... | .... | 9.75 | 10.04 | ± 0.08 |
| <i>b</i> | 8.88 | +0.01 | 8.90 | +0.03 | 8.82 | -0.05 | .... | .... | 8.87 | 9.16 | ± 0.03 |
| <i>y</i> | 9.27 | -0.02 | 9.43 | +0.14 | 9.17 | -0.12 | .... | .... | 9.29 | 9.58 | ± 0.09 |
| <i>z</i> | 8.56 | +0.15 | 8.41 | 0.00 | 8.25 | -0.16 | .... | .... | 8.41 | 8.70 | ± 0.10 |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9.08 | 9.38 | ± 0.08 |
| 12-INCH. | | | | | | | | | | | |
| Star. | September 11. | | October 30. | | November 1. | | November 2. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>a</i> | 9.96 | +0.05 | 9.97 | +0.06 | 9.84 | -0.07 | 9.86 | -0.05 | 9.91 | 10.20 | ± 0.06 |
| <i>b</i> | 8.82 | -0.09 | 8.87 | -0.04 | 8.93 | +0.02 | 9.02 | +0.11 | 8.91 | 9.20 | ± 0.06 |
| <i>y</i> | 9.28 | +0.01 | 9.14 | -0.13 | 9.28 | +0.01 | 9.38 | +0.11 | 9.27 | 9.56 | ± 0.06 |
| <i>z</i> | 8.26 | +0.03 | 8.33 | +0.10 | 8.27 | +0.04 | 8.06 | -0.17 | 8.23 | 8.52 | ± 0.08 |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9.08 | 9.37 | ± 0.06 |
| <i>e</i> | 11.22 | -0.06 | 11.18 | -0.10 | 11.33 | +0.05 | 11.39 | +0.11 | 11.28 | 11.57 | ± 0.08 |
| <i>d</i> | 11.65 | -0.20 | 11.75 | -0.10 | 12.09 | +0.24 | 11.93 | +0.08 | 11.85 | 12.14 | ± 0.15 |
| <i>m</i> | 12.12 | -0.14 | 12.10 | -0.16 | 12.45 | +0.19 | 12.39 | +0.13 | 12.26 | 12.55 | ± 0.14 |
| <i>f</i> | 10.40 | -0.01 | 10.39 | -0.02 | 10.43 | +0.02 | 10.42 | +0.01 | 10.41 | 10.70 | ± 0.01 |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11.46 | 11.75 | ± 0.10 |
| 40-INCH. | | | | | | | | | | | |
| Star. | February 12. | | December 26. | | January 28. | | January 31. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>d</i> | 11.76 | 0.00 | 11.85 | +0.04 | 11.81 | +0.05 | 11.68 | -0.08 | 11.76 | 12.05 | ± 0.06 |
| <i>e</i> | 11.42 | -0.04 | 11.17 | -0.16 | 11.53 | +0.07 | 11.55 | +0.09 | 11.46 | 11.75 | ± 0.11 |
| <i>m</i> | 12.22 | +0.04 | 12.39 | +0.12 | 12.07 | -0.11 | 12.16 | -0.02 | 12.18 | 12.47 | ± 0.08 |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11.80 | 12.09 | ± 0.08 |
| <i>B</i> | 12.95 | -0.11 | 13.35 | +0.09 | 13.03 | -0.03 | 13.00 | -0.06 | 13.06 | 13.35 | ± 0.06 |
| <i>C</i> | 13.55 | -0.29 | 14.22 | +0.05 | 13.84 | 0.00 | 13.79 | -0.05 | 13.84 | 14.13 | ± 0.03 |
| <i>D</i> | 13.79 | -0.49 | 14.41 | -0.18 | 14.33 | +0.05 | 14.40 | +0.12 | 14.28 | 14.57 | ± 0.12 |
| <i>E</i> | 13.27 | -0.21 | 13.87 | +0.09 | 13.36 | -0.12 | 13.52 | +0.04 | 13.48 | 13.77 | ± 0.06 |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 13.66 | 13.95 | ± 0.07 |

TABLE 21.—267 V ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|----------------------|---------|-----------|---|--|--------|-------|---------|-------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day. G. M. T. | | | | | Steps. | Mag. | | | |
| | 1897 | | 2410000+ | | | | | | | | | |
| 1 | Jan. 19 | 8 | 3944.58 | 80 | 6 | <i>f2v, v1-2e</i> | 29.1, 28.0 | 28.5 | 11.00 | moon | 0 | -0.33 |
| 2 | 21 | 8 | 3946.58 | 40 | 6 | <i>v</i> not seen ..... | ..... | ..... | ..... | poor | 2 | ..... |
| 3 | 22 | 7 | 3947.54 | 150 | 6 | <i>v3d, v0-1e, f4v</i> | 26.0, 27.0, 27.1 .. | 26.7 | 11.25 | good | 3 | -0.23 |
| 4 | 28 | 7 | 3953.54 | ... | 6 | <i>e2-3v, v2d, vg, v1-2h</i> .. | 24.0, 25.0, 20.4, 19.2. | 22.1 | 11.79 | .... | 9 | +0.12 |
| 5 | 30 | 7 | 3955.54 | 150 | 6 | <i>vd, v1-2h</i> | 23.0, 19.2 | 21.1 | 11.91 | fair | 11 | +0.16 |
| 6 | May 24 | 15 | 4069.88 | 150 | 6 | <i>d</i> glimpsed, <i>v</i> not seen .. | ..... | <23 | <11.7 | fair | 126 | ..... |
| 7 | July 21 | 10 | 4127.67 | 150 | 6 | <i>v4f, a3v</i> | 35.1, 34.4 | 34.7 | 10.21 | good | 184 | +0.87 |
| 8 | 27 | 10 | 4133.67 | 40 | 6 | <i>v1a, l2-3v</i> | 38.4, 38.9 | 38.6 | 9.69 | good | 190 | +0.36 |
| 9 | Aug. 3 | 9 | 4140.63 | 40 | 6 | <i>l4-5v, va, v6f</i> | 36.4, 37.4, 37.1 .. | 36.9 | 9.91 | fair | 197 | +0.49 |
| 10 | 8 | 16 | 4145.92 | 40 | 6 | <i>l4v</i> | 37.4 ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | 150 | 6 | <i>a2v, v4f</i> | 35.4, 35.1 | 35.9 | 10.04 | poor | 202 | +0.52 |
| 11 | 11 | 9 | 4148.63 | 80 | 6 | <i>a2v, v5f</i> | 35.4, 36.1 | 35.7 | 10.08 | .... | 205 | +0.50 |
| 12 | 19 | 9 | 4156.63 | 150 | 6 | <i>a3v, v3f</i> | 34.4, 34.1 | 34.2 | 10.28 | good | 213 | +0.51 |
| | | | | 150 | 6 | <i>a5v, v3f</i> | 32.4, 34.1 ..... | ..... | ..... | ..... | ..... | ..... |
| 13 | 27 | 9 | 4164.63 | 40 | 6 | <i>a4v, v2-3f</i> | 33.4, 33.6 | 33.4 | 10.37 | good | 221 | +0.40 |
| 14 | Sept. 5 | 7 | 4173.54 | 150 | 6 | <i>a10v, v1-2f</i> | 27.4, 29.6 | 29.1 | 10.91 | moon | 230 | +0.65 |
| 15 | 13 | 8 | 4181.58 | 150 | 6 | <i>f2v, v</i> limit ..... | ..... | 29.1 | 10.91 | moon | 238 | +0.32 |
| 16 | 16 | 7 | 4184.54 | 150 | 6 | <i>f4-5v, v2e, v6g</i> | 26.6, 28.5, 26.4 .. | 27.1 | 11.18 | fair | 240 | +0.52 |
| 17 | 18 | 9 | 4186.63 | 150 | 6 | <i>{b6a, a10f, f2e, fh, n30</i> .. | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | <i>{esm, e2d, d4g, g2h</i> ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18 | 20 | 8 | 4188.58 | 150 | 6 | <i>{f5v, v1-2e, v4d, v1t, vu</i> .. | 26.1, 28.0, 27.0, } 26.1 | 26.5 | 11.26 | .... | 244 | +0.45 |
| | | | | | | <i>{v38, n4e, e3d, d40, o3m</i> .. | 26.1, 26.1 ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | <i>{l3w, d3g, g2h, p4q, p1-2r</i> .. | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | <i>{p2v, limit 4 < m</i> ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | 21 | 17 | 4189.96 | 150 | 6 | <i>e1v, v3d</i> | 23.5, 26.0 | 25.7 | 11.35 | good | 246 | +0.43 |
| 20 | 25 | 8 | 4193.58 | 150 | 6 | <i>e4v, v1d, v1g</i> | 22.5, 24.0, 21.4 .. | 22.9 | 11.70 | good | 250 | +0.67 |
| 21 | 29 | 7 | 4197.56 | 150 | 6 | <i>e3-4v, v1d, v2g</i> | 23.0, 24.0, 22.4 .. | 23.1 | 11.67 | good | 254 | +0.50 |
| 22 | 30 | 16 | 4198.94 | 150 | 6 | <i>d1v, vg, v2h</i> | 22.0, 20.4, 19.7 .. | 20.7 | 11.97 | good | 255 | +0.76 |
| 23 | Oct. 14 | 7 | 4212.54 | 150 | 6 | <i>g4v, m3v, v</i> limit | 16.4, 17.9 | 17.1 | 12.40 | good | 10 | +0.69 |
| 24 | 25 | 7 | 4223.54 | 150 | 6 | <i>g5v, m4v, limit v</i> | 15.4, 16.9 | 16.1 | 12.51 | good | 21 | +0.41 |
| 25 | Nov. 16 | 7 | 4245.54 | 150 | 6 | <i>v</i> not seen, limit 5 < d .. | ..... | <18 | <12.3 | fine | 43 | ..... |
| 26 | Dec. 29 | 7 | 4288.54 | 150 | 6 | <i>v</i> not seen, limit 1-2 < g .. | ..... | <19 | <12.2 | moon | 86 | ..... |
| | 1898 | | | | | | | | | | | |
| 27 | Jan. 16 | 7 | 4306.54 | 150 | 6 | <i>v</i> not seen, limit <i>g</i> and <i>h</i> .. | ..... | <19 | <12.2 | good | 104 | ..... |
| 28 | 18 | 7 | 4308.54 | 150 | 6 | <i>v</i> not seen, limit 1 < g .. | ..... | <19 | <12.2 | good | 106 | ..... |
| 29 | Feb. 15 | 8 | 4336.58 | 150 | 6 | <i>v2m, n2v, f2-3v</i> | 22.9, 25.2, 28.6 .. | 25.5 | 11.37 | good | 134 | +0.03 |
| 30 | 23 | 7 | 4344.54 | 150 | 6 | <i>v2-3f, v2n, a6-7v</i> | 33.6, 29.2, 30.9 .. | 31.2 | 10.67 | good | 142 | -0.24 |
| 31 | Mar. 4 | 7 | 4353.54 | 40 | 6 | <i>a5-6v, v2n</i> | 31.9, 29.2 | 31.2 | 10.67 | fair | 151 | +0.16 |
| | | | | 150 | 6 | <i>a5v, v4n</i> | 32.4, 31.2 ..... | ..... | ..... | ..... | ..... | ..... |
| 32 | 13 | 7 | 4362.54 | 150 | 6 | <i>a2v, v10e, v7f, v6n, n1f</i> .. | 35.4, 36.5, 38.1, 33.2 | 35.8 | 10.08 | good | 160 | -0.09 |
| 33 | 16 | 7 | 4365.54 | 40 | 6 | <i>a1v, y3v, l3v</i> | 36.4, 38.5, 38.4 .. | 37.7 | 9.81 | good | 163 | -0.25 |
| 34 | 23 | 7 | 4372.54 | 40 | 6 | <i>v4-5a, vb, z2v, v3y, v3l</i> .. | {41.9, 44.6, 43.8 } {44.5, 44.4 | 43.8 | 9.00 | fair | 170 | -0.80 |
| 35 | 28 | 7 | 4377.54 | 40 | 6 | <i>z1-2v, v4y, v3l, v2A'</i> | 44.3, 45.5, 44.4, 45.9 | 45.0 | 8.81 | good | 175 | -0.79 |
| 36 | Apr. 15 | 16 | 4395.92 | 40 | 6 | <i>vz±, difficult</i> | 46± | 46± | 8.7± | poor | 194 | -0.7± |
| 37 | June 27 | 13 | 4468.89 | 80 | 12 | <i>d1v, v1m, v4A</i> | 22.0, 19.9, 20.0 .. | 20.6 | 11.98 | good | 9 | +0.30 |
| 38 | July 6 | 11 | 4477.71 | 80 | 12 | <i>d2v, v</i> glimpsed ..... | ..... | 21.0 | 11.93 | poor | 18 | -0.06 |
| 39 | 12 | 11 | 4483.71 | 275 | 12 | <i>d5v, g4v, h2v, v4B, vA</i> | {18.0, 16.4, 15.7 } {15.5, 16.0 | 16.3 | 12.49 | .... | 24 | +0.31 |
| | | | | 80 | 12 | <i>A3-4v, v1B</i> | 12.5, 12.5 ..... | ..... | ..... | ..... | ..... | ..... |
| 40 | 25 | 12 | 4496.85 | 275 | 12 | <i>B1v, v4C, limit C</i> | 10.5, 8.7 | 11.3 | 13.07 | good | 37 | +0.46 |
| | | | | 460 | 40 | <i>v3B, v4-5C</i> | 14.5, 9.2 ..... | ..... | ..... | ..... | ..... | ..... |
| 41 | Aug. 9 | 10 | 4511.77 | 175 | 12 | <i>v</i> not seen, limit 6 < d or 2 < A .. | <17, <15 | <16 | <12.5 | .... | 52 | ..... |
| 42 | 17 | 11 | 4519.71 | 275 | 12 | <i>d6B, B3C, Cv, limit v</i> ..... | ..... | 4.7 | 13.83 | good | 59 | +0.53 |

TABLE 21.—267 V ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|------|----------------|---------------|---------------------|---------|-----------|--|------------------------|--------|--------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1898 | | | | | | | | | | | | |
| 43 | Oct. 11 | 7 | 2410000+ | 80 | 6 | v not seen, limit 4 < d... | | < 19 | < 12.2 | fair | 114 | .... |
| 44 | Nov. 2 | 7 | 4574.54 | 150 | 6 | v1-2 <i>g</i> , v1 <i>d</i> , e3 <i>v</i> | 21.9, 24.0, 23.5 .. | 23.1 | 11.67 | good | 136 | +0.48 |
| 45 | 12 | 8 | 4596.54 | 150 | 6 | v4 <i>d</i> , v2 <i>e</i> , n0- <i>v</i> | 27.0, 28.5, 26.7 .. | 27.4 | 11.13 | good | 146 | +0.36 |
| 46 | 19 | 7 | 4606.58 | 150 | 6 | a10 <i>v</i> , v2 <i>n</i> , v3 <i>f</i> | 27.4, 29.2, 34.1 .. | 30.2 | 10.73 | good | 153 | +0.33 |
| 47 | Dec. 3 | 7 | 4613.54 | 40 | 6 | a1 <i>v</i> , v1 <i>E'</i> | 36.4, 36.4 .. | 36.4 | 9.98 | good | 167 | +0.08 |
| 48 | 9 | 6 | 4627.54 | 40 | 6 | v3 <i>a</i> , b3 <i>v</i> | 40.4, 41.6 .. | 41.0 | 9.37 | good | 173 | -0.31 |
| 49 | 17 | 7 | 4633.50 | 40 | 6 | v5 <i>a</i> , b1 <i>v</i> , v1 <i>y</i> | 42.4, 43.6, 43.6 .. | 43.1 | 9.09 | good | 181 | -0.30 |
| 50 | 28 | 6 | 4641.54 | 40 | 6 | v <i>y</i> , A'3 <i>v</i> , v5 <i>a</i> , b4 <i>v</i> | 41.5, 40.9, 42.4, 39.6 | 41.1 | 9.34 | good | 192 | -0.02 |
| 1899 | | | | | | | | | | | | |
| 51 | Jan. 2 | 6 | 4652.50 | 40 | 6 | v1 <i>y</i> , A'3 <i>v</i> , v4 <i>a</i> , b3 <i>v</i> | 42.5, 40.9, 41.4, 41.6 | 41.6 | 9.30 | good | 197 | -0.12 |
| 52 | 9 | 6 | 4657.50 | 40 | 6 | v <i>y</i> , A'2 <i>v</i> , v4 <i>a</i> , b4 <i>v</i> | 41.5, 41.9, 41.4, 40.6 | 41.3 | 9.32 | good | 204 | -0.24 |
| 53 | 19 | 7 | 4664.50 | 40 | 6 | A'4 <i>v</i> , b4-5 <i>v</i> , y2 <i>v</i> , v2 <i>a</i> ... | 39.9, 40.1, 39.5, 39.4 | 39.7 | 9.54 | good | 214 | +0.23 |
| 54 | 28 | 6 | 4674.54 | 40 | 6 | A'6 <i>v</i> , y4 <i>v</i> , a1 <i>v</i> , v6-8 <i>f</i> ... | 37.9, 37.5, 36.4, 38.1 | 37.4 | 9.86 | good | 223 | +0.09 |
| 55 | Feb. 7 | 7 | 4683.50 | 40 | 6 | a5 <i>v</i> , v3-4 <i>n</i> , v4 <i>f</i> | 32.4, 30.7, 35.1 .. | 32.7 | 10.47 | good | 233 | +0.10 |
| 56 | 28 | 8 | 4693.54 | 150 | 6 | a7 <i>v</i> , v <i>n</i> , v4-5 <i>d</i> | 30.4, 27.2, 27.5 .. | 28.3 | 11.01 | good | 254 | -0.18 |
| 57 | Mar. 13 | 8 | 4714.62 | 150 | 6 | v1 <i>d</i> | 37.4..... | 37.4 | 11.57 | low | 9 | -0.11 |
| 58 | July 29 | 10 | 4727.58 | 150 | 6 | f1 <i>v</i> , v3-4 <i>n</i> , v5 <i>e</i> | 30.1, 30.7, 31.5 .. | 30.7 | 10.72 | good | 148 | +0.04 |
| 59 | Aug. 10 | 9 | 4865.67 | 40 | 6 | a4 <i>v</i> , v4 <i>f</i> | 33.4, 35.1 .. | 34.2 | 10.27 | good | 160 | +0.09 |
| 60 | 26 | 9 | 4877.63 | 40 | 6 | v6 <i>f</i> , v1 <i>a</i> , b4-5 <i>v</i> | 37.1, 38.4, 40.1 .. | 38.5 | 9.70 | good | 175 | +0.10 |
| 61 | Sept. 11 | 8 | 4893.63 | 40 | 6 | l1-2 <i>v</i> , v1 <i>a</i> | 40.9, 39.4 .. | 40.1 | 9.49 | .... | 192 | +0.13 |
| 62 | 20 | 8 | 4909.58 | 150 | 6 | v <i>a</i> | 37.4..... | 37.4 | 9.83 | good | 200 | +0.35 |
| 63 | Oct. 2 | 8 | 4918.58 | 40 | 6 | l3-4 <i>v</i> , v1 <i>a</i> | 38.4, 37.9 .. | 38.6 | 9.70 | good | 212 | -0.04 |
| 64 | 7 | 7 | 4930.58 | 40 | 6 | v1 <i>a</i> , l4 <i>v</i> , b4-5 <i>v</i> | 38.4, 37.4, 40.1 .. | 38.6 | 9.70 | good | 217 | -0.17 |
| 65 | 23 | 7 | 4935.54 | 150 | 6 | l2-3 <i>v</i> , v2 <i>a</i> , b4-5 <i>v</i> | 38.9, 37.4, 40.1 .. | 37.9 | 9.80 | good | 233 | -0.58 |
| 66 | 30 | 7 | 4951.54 | 150 | 6 | v0-1 <i>a</i> | 37.9..... | 33.2 | 10.40 | good | 240 | -0.27 |
| 67 | Nov. 4 | 7 | 4958.60 | 150 | 6 | a5 <i>v</i> , v4 <i>f</i> , v5 <i>n</i> | 32.4, 35.1, 32.2 .. | 33.3 | 10.39 | good | 245 | -0.30 |
| 68 | 20 | 7 | 4963.50 | 150 | 6 | a5 <i>v</i> , v3 <i>n</i> , v6 <i>e</i> | 32.4, 35.1, 32.5 .. | 29.2 | 10.90 | fair | 3 | -0.58 |
| 69 | 26 | 6 | 4979.54 | 150 | 6 | v <i>n</i> , v2 <i>e</i> , v8-10 <i>d</i> | 27.2, 28.5, 32.0 .. | 25.4 | 11.38 | good | 9 | -0.29 |
| 70 | Dec. 5 | 6 | 4985.50 | 150 | 6 | e4 <i>v</i> , v <i>n</i> , ? v3-4 <i>d</i> | 22.5, 27.2, 26.5 .. | 24.2 | 11.53 | good | 18 | -0.45 |
| 71 | 19 | 7 | 4994.52 | 200 | 6 | e4 <i>v</i> , v2 <i>d</i> , n2 <i>v</i> | 22.5, 25.0, 25.2 .. | 20.9 | 11.96 | good | 32 | -0.48 |
| 72 | 28 | 6 | 5008.54 | 150 | 6 | d1 <i>v</i> , v1 <i>m</i> , g1-2 <i>v</i> | 22.0, 21.9, 18.9 .. | 18.4 | 12.25 | good | 41 | -0.49 |
| 1900 | | | | | | | | | | | | |
| 73 | Jan. 2 | 6 | 5017.50 | 200 | 6 | m3 <i>v</i> , d4 <i>v</i> , limit v..... | 17.4, 19.0 .. | 18.2 | 12.28 | good | 46 | -0.62 |
| 74 | 24 | 7 | 5022.50 | 150 | 6 | v not seen, limit 2 < m... | | < 19 | < 12.2 | .... | 68 | .... |
| 75 | 26 | 6 | 5044.54 | 350 | 40 | { E2 <i>v</i> , v4 <i>C</i> , E4 <i>C</i> , C5 <i>D</i> } { b2 <i>g</i> , d4 <i>m</i> , m8 <i>B</i> , B4 <i>E</i> } { E3 <i>v</i> , v3 <i>C</i> , E2 <i>v</i> , v6 <i>C</i> } { d6 <i>m</i> , m8-10 <i>B</i> , B4 <i>E</i> } (C4-5 <i>D</i> , limit 6-8 < D) | 7.1, 8.7 .. | 7.9 | 13.49 | good | 70 | +0.02 |
| 76 | Feb. 4 | 8 | 5046.50 | 350 | 40 | v2 <i>E</i> , v2 <i>B</i> , m10 <i>v</i> | 11.1, 11.5, 10.9 .. | 11.1 | 10.13 | good | 98 | 0.00 |
| 77 | 22 | 8 | 5055.58 | 350 | 40 | B <i>v</i> , v2 <i>E</i> , limit E..... | 11.5, 11.1 .. | 11.4 | 13.05 | good | 100 | +0.02 |
| 78 | 24 | 9 | 5073.58 | 175 | 12 | d2 <i>v</i> , v1 <i>m</i> | 21.0, 21.9 .. | 21.4 | 11.88 | fair | 110 | -0.63 |
| 79 | Mar. 7 | .. | 5086.6 | 275 | 12 | a10 <i>v</i> , v <i>f</i> , v6-8 <i>e</i> , v10 <i>d</i> ... | 27.4, 31.1, 37.5, 33.0 | 31.2 | 10.67 | good | 124 | -1.14 |
| 80 | 21 | 8 | 5100.58 | .. | 12 | A'1 <i>v</i> , v <i>y</i> , v6 <i>a</i> | 42.9, 41.5, 43.4 .. | 42.6 | 9.15 | fair | 185 | -0.17 |
| 81 | May 20 | 14 | 5160.83 | 40 | 6 | b4-5 <i>v</i> , v1 <i>a</i> | 40.1, 38.4 .. | 39.2 | 9.60 | good | 221 | -0.37 |
| 82 | June 25 | 14 | 5196.83 | 40 | 6 | v4 <i>d</i> , v1 <i>m</i> , v <i>f</i> | 27.0, 28.2, 31.1 .. | 28.7 | 10.97 | good | 256 | -0.30 |
| 83 | July 30 | 10 | 5231.67 | 40 | 6 | d2 <i>v</i> , v1 <i>g</i> | 21.0, 21.4 .. | 21.2 | 11.90 | fair | 24 | -0.27 |
| 84 | Aug. 26 | 8 | 5258.58 | 150 | 6 | d5 <i>v</i> , v6-8 <i>B</i> | 18.0, 18.5 .. | 18.2 | 12.28 | good | 36 | -0.30 |
| 85 | Sept. 6 | 11 | 5269.71 | 237 | 40 | v glimpsed, limit 3-4 < d... | | < 19 | < 12.2 | good | 44 | .... |
| 86 | 15 | 7 | 5278.54 | 150 | 6 | E and v glimpsed..... | | 9± | 13.3± | poor | 64 | -0.1± |
| 87 | Oct. 4 | 15 | 5297.88 | 350 | 40 | E1 <i>v</i> , v1 <i>C</i> , v4 <i>D</i> | 8.1, 5.7, 4.0 .. | 5.9 | 13.70 | good | 78 | +0.21 |
| 88 | 18 | 10 | 5311.67 | 237 | 40 | B6 <i>v</i> , v1 <i>E</i> , v2 <i>C</i> | 5.5, 10.1, 6.7 .. | 7.4 | 13.53 | good | 82 | +0.05 |
| 89 | 23 | 6 | 5316.50 | 237 | 40 | | | | | | | |
| 1901 | | | | | | | | | | | | |
| 90 | Feb. 9 | 9 | 5425.63 | 40 | 6 | v <i>l</i> , v4-5 <i>a</i> | 41.4, 41.9 .. | 41.7 | 9.27 | fair | 192 | -0.08 |

TABLE 21.—267 V ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|-----------------|---------------|---------------------|---------|-----------|--|-----------------------|--------|-------|---------|-----|---------------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 91 | 1901 Nov. 1 | 7 | 2410000+ 5689.54 | 80 | 3 | <i>A'iv, vb</i> | 42.9, 44.6 | 43.7 | 9.00 | .... | 197 | -0.42 |
| 92 | 1902 Feb. 12 | .. | 5793.5 | 237 | 40 | <i>vo-1B</i> ..... | ..... | 12.0 | 13.00 | .... | 43 | +0.19 |
| 93 | 23 | .. | 5804 | ... | 24 | photograph, <i>E4v, v4C</i> ... | 5.1, 8.7 | 6.9 | 13.6± | .... | 54 | +0.43 |
| 94 | Oct. 31 | 10 | 6054.67 | 237 | 40 | <i>E1v, v1C</i> | 8.1, 5.7 | 6.9 | 13.60 | fair | 47 | +0.67 |
| 95 | Dec. 26 | .. | 6120.6 | 237 | 40 | <i>E3v, E1v, v3C</i> | 8.5, 8.1, 7.7 ... | 8.1 | 13.45 | good | 112 | +1.03 |
| 96 | 1903 Oct. 11 | 7 | 6399.54 | 150 | 6 | <i>v7d, v4e, n1v</i> | 30.0, 30.5, 26.2. | 28.9 | 10.96 | good | 133 | -0.40 |
| 97 | 1904 Aug. 29 | .. | 6722 | 150 | 6 | <i>a10v±, v2-3f</i>..... | ..... | 33.6 | 10.35 | fair | 198 | +0.93 |
| 98 | Sept. 11 | 10 | 6735.67 | 67 | 12 | photometer ..... | ..... | .... | 10.14 | good | 212 | +0.41 |
| 99 | Oct. 6 | 10 | 6760.67 | 40 | 6 | photometer ..... | ..... | .... | 10.52 | fine | 237 | -0.02 |
| 100 | Nov. 15 | .. | 6800 | ... | 24 | photographs ..... | ..... | .... | 12.3 | .... | ... | .... |
| 101 | 29 | 6 | 6814.50 | 40 | 6 | <i>v</i> not seen, limit 3-4 < <i>d</i> .. | ..... | <19 | <12.2 | fair | 32 | .... |
| 102 | Dec. 5 | 7 | 6820.54 | ... | 12 | <i>v</i> glimpsed, <i>m5v±</i>..... | ..... | 15.9 | 12.5± | good | 38 | -0.12 |
| 103 | 1905 Jan. 28 | 9 | 6874.60 | 237 | 40 | photometer ..... | ..... | .... | 13.34 | good | 92 | +0.04 |
| 104 | Feb. 25 | 7 | 6902.54 | 237 | 40 | <i>d3v, v3m</i> | 20.0, 23.9 | 22.0 | 11.79 | good | 120 | -0.20 |
| 105 | Mar. 5 | 7 | 6910.54 | 67 | 12 | <i>d2v, e1v, v2m</i> | 23.0, 25.5, 22.9. | 23.8 | 11.60 | good | 128 | -0.07 |
| 106 | May 22 | 15 | 6986.88 | 20 | 5 | <i>b4v, v6a</i> | 40.6, 43.4 | 41.8 | 9.27 | fair | 204 | -0.33 |
| 107 | Aug. 6 | 15 | 7064.88 | 237 | 40 | <i>d1v, v2m</i> | 22.0, 22.9 | 22.4 | 11.75 | good | 24 | -0.45 |
| 108 | 9 | 15 | 7067.88 | 150 | 6 | <i>d2-3v, v2-3m</i> | 20.5, 23.4 | 22.0 | 11.80 | fair | 37 | -0.87 |
| 109 | 28 | 9 | 7086.63 | 150 | 6 | <i>d4-5v, vm</i> | 18.5, 20.9 | 20.1 | 12.03 | fair | 46 | -0.90 |
| 110 | Sept. 19 | 10 | 7108.67 | 237 | 40 | <i>B4v, v1E, v3C</i> | 7.5, 10.1, 7.7 .. | 8.9 | 13.35 | fair | 68 | -0.13 |
| 111 | Oct. 1 | 9 | 7120.63 | 237 | 40 | <i>B1v, vE, v1C</i> | 10.5, 9.1, 5.7 .. | 8.4 | 13.40 | fair | 80 | -0.05 |
| 112 | 20 | 8 | 7139.58 | 80 | 12 | <i>v</i> not seen, limit <i>B</i>..... | ..... | <12 | <13.0 | good | ... | -0.07 |
| 113 | 24 | 8 | 7143.58 | 237 | 40 | <i>v1-2B, v5C, v5E, m6-8v</i> . | 13.0, 9.7, 14.1, 13.8 | 12.7 | 12.92 | good | 103 | +0.07 |
| 114 | 31 | 9 | 7150.63 | 237 | 40 | <i>v2-3B, v6C, m8v</i> | 14.0, 10.7, 12.8 | 13.9 | 12.78 | good | 110 | +0.26 |
| 115 | Dec. 23 | 10 | 7203.69 | 237 | 40 | <i>v6-8d, a10-12v</i> | 30.0, 26.4 | 29 | 10.9 | fair | 163 | +0.9 |

TABLE 22.—267 V ANDROMEDÆ. MEAN MAGNITUDES FROM 21.5 DAY GROUPS.

| Group No.... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------|------------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|
| J. D..... | 21.5 | 43 | 64.5 | 86 | 107.5 | 129 | 150.5 | 172 | 193.5 | 215 | 236.5 | 258 |
| 3944 | t | 6 | .... | .... | .... | .... | .... | .... | 187 | 204 | 226 | 247 |
| | M | 11.49 | .... | .... | .... | .... | .... | .... | 9.95 | 10.08 | 10.64 | 11.43 |
| | ΔM | -0.07 | .... | .... | .... | .... | .... | .... | +0.62 | +0.50 | +0.52 | +0.52 |
| | No. | 4 | .... | .... | .... | .... | .... | .... | 2 | 4 | 2 | 7 |
| 4202 | t | 16 | .... | .... | .... | .... | 138 | 161 | 175 | 194 | .... | .... |
| | M | 12.46 | .... | .... | .... | .... | 11.02 | 9.89 | 8.81 | 8.7± | .... | .... |
| | ΔM | +0.55 | .... | .... | .... | .... | -0.10 | -0.24 | -0.79 | -0.7± | .... | .... |
| | No. | 2 | .... | .... | .... | .... | 2 | 4 | 1 | 1 | .... | .... |
| 4460 | t | 14 | 30 | 59 | .... | .... | 141 | 160 | 182 | 205 | 228 | 254 |
| | M | 11.96 | 12.78 | 13.83 | .... | .... | 11.40 | 10.38 | 9.27 | 9.39 | 10.16 | 11.01 |
| | ΔM | +0.12 | +0.38 | +0.53 | .... | .... | +0.42 | +0.20 | -0.21 | -0.20 | +0.10 | -0.18 |
| | No. | 2 | 2 | 1 | .... | .... | 2 | 2 | 3 | 3 | 2 | 1 |
| 4718 | t | 9 | .... | .... | .... | .... | 148 | 160 | 184 | 206 | 225 | 242 |
| | M | 11.57 | .... | .... | .... | .... | 10.72 | 10.27 | 9.60 | 9.76 | 9.75 | 10.50 |
| | ΔM | -0.11 | .... | .... | .... | .... | +0.04 | +0.09 | +0.12 | +0.16 | -0.38 | -0.28 |
| | No. | 1 | .... | .... | .... | .... | 1 | 1 | 2 | 2 | 2 | 2 |
| 4976 | t | 10 | 36 | 46 | 75 | 99 | 117 | .... | 185 | .... | 221 | 256 |
| | M | 11.27 | 12.10 | 12.28 | 13.49 | 13.08 | 11.28 | .... | 9.15 | .... | 9.60 | 10.97 |
| | ΔM | -0.44 | -0.48 | -0.62 | +0.01 | +0.01 | -0.88 | .... | -0.17 | .... | -0.37 | -0.30 |
| | No. | 3 | 2 | 1 | 3 | 2 | 2 | .... | 1 | .... | 1 | 1 |
| 5234 | t | .... | 30 | 64 | 80 | .... | .... | .... | 192 | .... | .... | .... |
| | M | .... | 12.09 | 13.3± | 13.62 | .... | .... | .... | 9.27 | .... | .... | .... |
| | ΔM | .... | -0.28 | -0.10 | +0.13 | .... | .... | .... | -0.08 | .... | .... | .... |
| | No. | .... | 2 | 1 | 2 | .... | .... | .... | 1 | .... | .... | .... |
| 5492 | t | .... | .... | .... | .... | .... | .... | .... | .... | 197 | .... | .... |
| | M | .... | .... | .... | .... | .... | .... | .... | .... | 9.00 | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | -0.42 | .... | .... |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | 1 | .... | .... |
| 5750 | t | .... | .... | 48 | .... | .... | .... | .... | .... | .... | .... | .... |
| | M | .... | .... | 13.3± | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | +0.31 | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | .... | .... | 2 | .... | .... | .... | .... | .... | .... | .... | .... |
| 6008 | t | .... | .... | 47 | .... | .... | 112 | .... | .... | .... | .... | .... |
| | M | .... | .... | 13.60 | .... | .... | 13.45 | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | +0.67 | .... | .... | +1.03± | .... | .... | .... | .... | .... |
| | No. | .... | .... | 1 | .... | .... | 1 | .... | .... | .... | .... | .... |
| 6266 | t | .... | .... | .... | .... | .... | 133 | .... | .... | .... | .... | .... |
| | M | .... | .... | .... | .... | .... | 10.96 | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | -0.40 | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... |
| 6524 | t | .... | .... | .... | .... | .... | .... | .... | .... | 205 | .... | 237 |
| | M | .... | .... | .... | .... | .... | .... | .... | .... | 10.24 | .... | 10.52 |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | +0.67 | .... | -0.02 |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | 2 | .... | 1 |
| 6782 | t | .... | 38 | .... | 92 | .... | 120 | .... | .... | .... | .... | .... |
| | M | .... | 12.5± | .... | 13.34 | .... | 11.79 | .... | .... | .... | .... | .... |
| | ΔM | .... | -0.12 | .... | +0.04 | .... | -0.20 | .... | .... | .... | .... | .... |
| | No. | .... | 1 | .... | 1 | .... | 1 | .... | .... | .... | .... | .... |
| Means | t | 11 | 32 | 53 | 82 | 99 | 116 | 140 | 160 | 184 | 202 | 225 |
| | M | 11.75 | 12.37 | 13.26 | 13.48 | 13.08 | 12.17 | 11.02 | 10.18 | 9.34 | 9.53 | 10.04 |
| | ΔM | +0.01 | -0.13 | +0.16 | +0.06 | +0.01 | -0.02 | -0.01 | +0.02 | -0.08 | +0.03 | -0.03 |
| | No. | 12 | 7 | 6 | 6 | 2 | 4 | 6 | 7 | 10 | 13 | 7 |

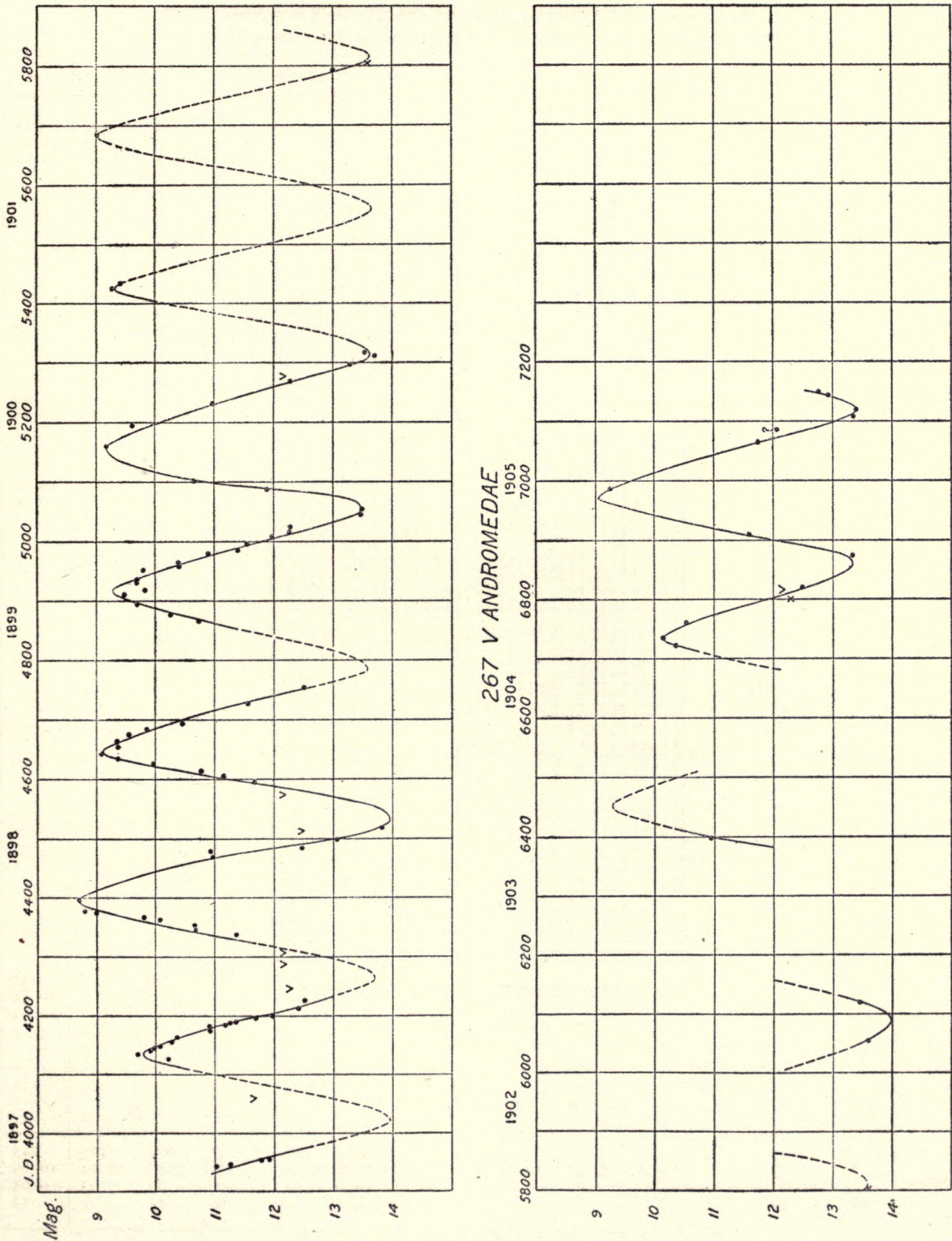


FIG. 8.—LIGHT-CURVE OF V ANDROMEDÆ.

TABLE 23.—267 V ANDROMEDÆ. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1897 July 26 (J. D. 2414132)+259^d (E-i). M-m=111^d.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|---------------|-------|-------|-------|-------|-----|---------|--------------|-------|-------|-------|-------|-----|
| poch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 1 | 1897 July 26 | 4132 | 9.7 | 10.0 | 0 | 10 | 1 | 1897 Apr. 10 | 4025 | .... | mc | + 4 | 3 |
| 2 | 1898 Apr. 15 | 4395 | 8.70 | 8.99 | + 4 | 12 | 2 | Dec. 8 | 4267 | .... | mc | -13 | 4 |
| 3 | Dec. 20 | 4644 | 9.10 | 9.39 | - 6 | 20 | 3 | 1898 Sept. 1 | 4534 | 13.90 | 14.19 | - 5 | 10 |
| 4 | 1899 Sept. 20 | 4918 | 9.40 | 9.69 | + 9 | 17 | 4 | 1899 May 10 | 4785 | .... | mc | -13 | 2 |
| 5 | 1900 May 17 | 5157 | 8.9 | 9.2 | -11 | 8 | 5 | 1900 Feb. 5 | 5056 | 13.40 | 13.69 | - 1 | 21 |
| 6 | 1901 Feb. 6 | 5422 | 9.3 | 9.6 | - 5 | 1 | 6 | Oct. 24 | 5317 | 13.67 | 13.96 | + 1 | 5 |
| 7 | Oct. 22 | 5680 | 9.0 | 9.3 | - 6 | 1 | 7 | 1901 June 24 | 5560 | .... | mc | -15 | 1 |
| 10 | 1903 Dec. 1 | 6450 | .... | mc | -13 | 1 | 8 | 1902 Mar. 9 | 5818 | 13.6 | 13.9 | -16 | 2 |
| 11 | 1904 Sept. 9 | 6733 | 10.10 | 10.39 | +11 | 6 | 9 | Dec. 4 | 6088 | 14.0 | 14.3 | - 5 | 3 |
| 12 | 1905 May 5 | 6971 | 9.06 | 9.35 | -10 | 4 | 12 | 1905 Jan. 11 | 6857 | 13.32 | 13.61 | -13 | 4 |

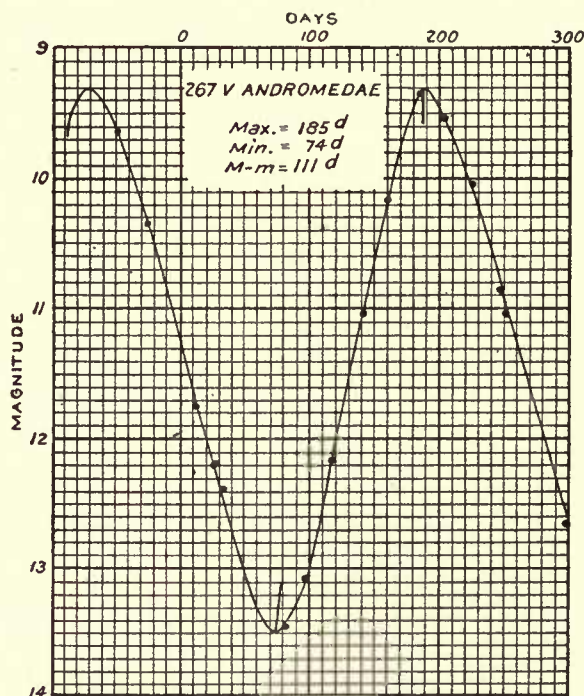


FIG. 9.—MEAN LIGHT-CURVE OF V ANDROMEDÆ.
See Table 22, page 42.

CHAPTER IV.

787 W ANDROMEDÆ.

R. A. 2^h 11^m 14^s.1; Dec. +43° 50' 26" (1900).

This is another of Anderson's discoveries, announced in the *Nachrichten* under date January 8, 1898. Observations began at once with the star on the descending branch of the light-curve. The first minimum was below the limit of the 6-inch, but the following maximum was well covered and the second minimum was observed with the 12- and 40-inch telescopes, then followed occasional observations, frequent enough to fix the number of the epoch, till the minimum and maximum of 1904 and 1905, for which more numerous observations were made. Comparing with the earlier dates the period 396 days was found and the mean light-curve deduced, using comparisons up to February 25, 1905. The subsequent maximum, 1905 May 31, indicates a slightly longer period, perhaps 397 days.

The characteristic features of the light-curve are: first, a large range, from about 7th to fainter than 13th magnitude; second, a steady variation, unbroken by secondary curves, therefore the normal points from Table 31 lie close to the mean light-curve.

The comparison star *c* has been suspected of variability by Hagen (A. N. 164, 79), and confirmatory observations are given by Williams (A. N. 164, 371). Provisional magnitudes were published by the writer in A. J. 24, 25. To give an idea of the possible variation, these are summarized below, Williams' observations being reduced to magnitudes by assuming his star *a* (my *b*) to be 9.53, and his star *b* (my *f*) to be 9.57.

| Hagen. | | Williams. | | Parkhurst. | |
|---------------|------|--------------|------|--------------|------|
| Date. | Mag. | Date. | Mag. | Date. | Mag. |
| 1900 Nov. 12 | 9.9 | 1900 Dec. 13 | 9.55 | 1899 Feb. 6 | 9.5 |
| 1901 Feb. 6 | 9.2 | 21 | 9.70 | Oct. 18 | 9.5 |
| 10 | 9.2 | 1901 Jan. 14 | 9.60 | 23 | 9.4 |
| Oct. 15 | 9.2 | Feb. 13 | 9.38 | 28 | 9.3 |
| Nov. 21 | 9.2 | 15 | 9.42 | Nov. 4 | 9.2 |
| 1902 Oct. 8 | 8.9 | 1902 Jan. 31 | 9.68 | 1900 Feb. 16 | 9.6 |
| 1903 Sept. 22 | 8.8 | Dec. 29 | 9.62 | 1902 Feb. 4 | 9.27 |
| 24 | 8.8 | 31 | 9.70 | Mar. 4 | 9.14 |
| Oct. 20 | 8.8 | | | 27 | 9.20 |
| Nov. 18 | 8.9 | | | Oct. 29 | 9.13 |
| | | | | 1903 Nov. 17 | 9.24 |
| | | | | 18 | 9.31 |
| | | | | 19 | 9.26 |
| | | | | Dec. 6 | 9.23 |
| | | | | 21 | 9.40 |
| | | | | Nov. 11 | 9.15 |
| | | | | 1904 Oct. 30 | 9.19 |

With one exception, the range in either series does not exceed 0.4 magnitude, a rather slender basis to prove variability, thus throwing the burden of proof on the first observation in Hagen's series. But this is not confirmed by the nearly simultaneous observations by Williams, so that the matter is left in doubt. An idea of the color of the stars can be obtained from the following summary of visual and photographic results. The visual magnitudes are photometric, the photographic are from a Seed 27 plate and a Cramer isochromatic plate.

| Star. | Vis. | Seed. | Iso. |
|----------|-------|-------|-------|
| <i>a</i> | 9.15 | 9.12 | 9.13 |
| <i>o</i> | 8.93 | 8.95 | 8.95 |
| <i>b</i> | 9.53 | 9.53 | 9.53 |
| <i>g</i> | 11.05 | 11.05 | 11.05 |
| <i>f</i> | 10.12 | 9.58 | 9.70 |
| <i>c</i> | 9.28 | 9.80 | 9.66 |

The stars *a*, *o*, *b*, and *g*, with their visual magnitudes, were used as standards from which to obtain the photographic magnitudes of *f* and *c*. It will be noticed that the star *c* is shown to be yellow as its photographic magnitude is 0.4 to 0.5 fainter than the visual, while the star *f* is blue, photographing 0.4 or 0.5 brighter than the visual magnitude. This is confirmed by the visual observations of Hagen and the writer, compared with the photographic results of Williams.

TABLE 24.—W ANDROMEDÆ. STANDARD MAGNITUDE STARS.

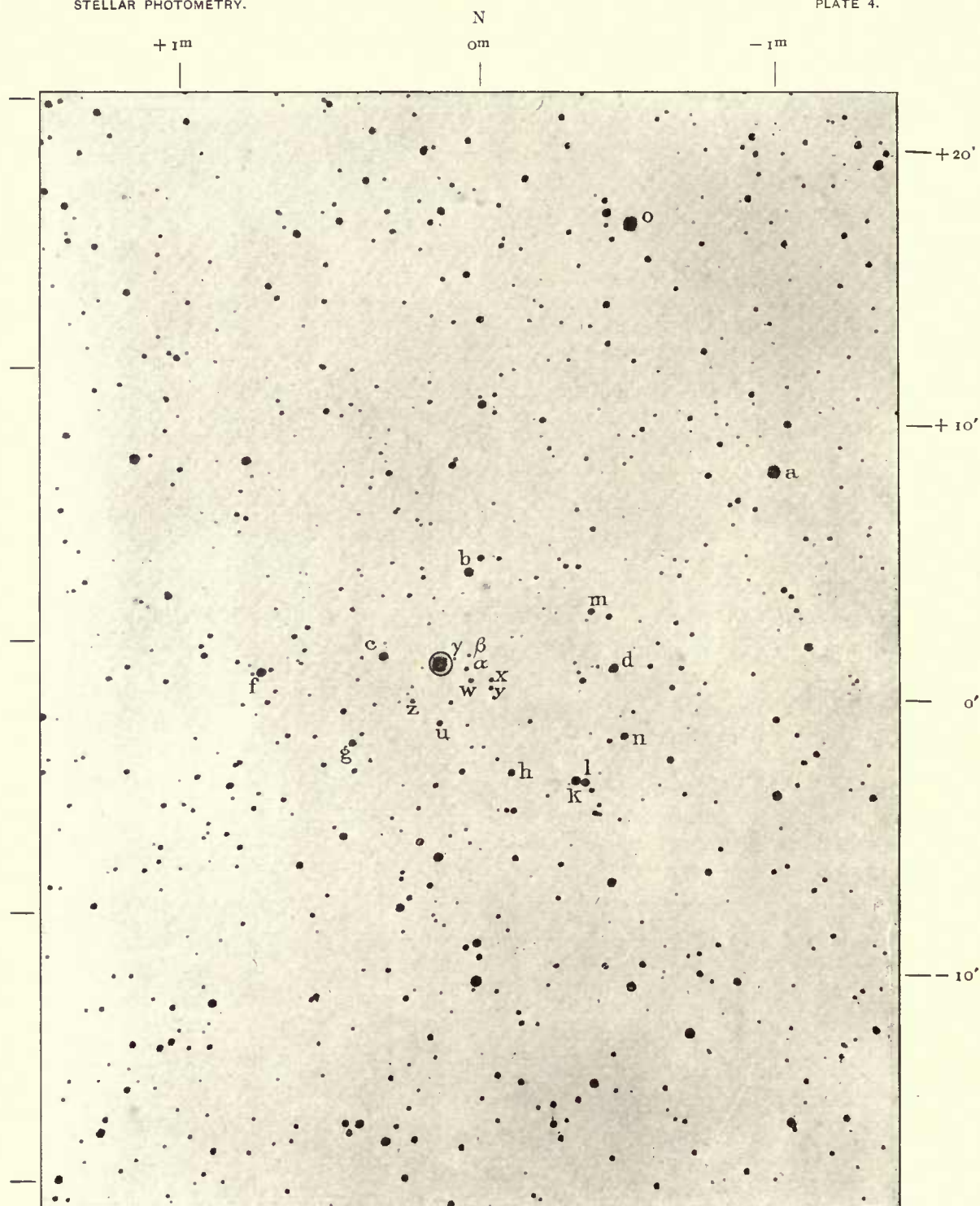
| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|----------|--------------|-------------------------|---------------|-----------------|------------|--------|-----------|------|------------|----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P. DM. | H. | P. | H. | P. | |
| <i>D</i> | ° +42 480 | <i>h m s</i> 2 09 48 | ° +42 13.9 | GW— | 7.61 | 8.14 | 7.73 | 8.14 | +12 | 0 | ±7 |
| <i>E</i> | +42 506 | 2 16 31 | +43 03.6 | GW— | 7.44 | 7.92 | 7.44 | 7.85 | 0 | -7 | ±2 |
| <i>r</i> | +43 474 | 2 15 14 | +44 08.5 | GW | 6.96 | 7.20 | 6.85 | 7.26 | -11 | +6 | ±9 |
| | Means . . . | ..... | ..... | ..... | 7.34 | 7.75 | 7.34 | 7.75 | ± 8 | ±4 | ±6 |

TABLE 25.—COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|---------|------|--------------|----------|----------|---------|------|--------------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | ° | | <i>h m s</i> | ° ' | | ° | | <i>h m s</i> | ° ' |
| <i>a</i> | +43 457 | 8.9 | 2 7 18 | +43 45.6 | <i>r</i> | +43 474 | 6.5 | 2 12 24 | +43 56.0 |
| <i>o</i> | +43 460 | 9.0 | 2 7 51 | +43 54.3 | <i>p</i> | +43 478 | 8.0 | 2 12 53 | +43 36.6 |
| <i>b</i> | +43 461 | 9.5 | 2 8 21 | +43 41.6 | <i>q</i> | +43 482 | 8.2 | 2 14 11 | +43 43.1 |
| <i>c</i> | +43 462 | 9.5 | 2 8 37 | +43 37.5 | | | | | |

STELLAR PHOTOMETRY.

PLATE 4.



Scale, 1 mm = 13".

S

1902 January 12

787 W ANDROMEDÆ.

R. A. 2h 11m 14s.1. Dec. +43° 50' 26", 1900

TABLE 26.—COMPARISON STARS FOR W ANDROMEDÆ (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|----------|----------------------------|-------|-------|---------------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | | | | | H. | P. | H. | P. |
| | " | s | " | | | | | |
| <i>a</i> | —721 | —66.6 | +468 | 37.8 | 9.15 | 9.56 | ..... | ..... |
| <i>n</i> | —421 | —38.9 | —131 | 21.8 | ..... | ..... | 11.09 | 11.50 |
| <i>d</i> | —387 | —35.8 | —15 | 25.8 | ..... | ..... | 10.61 | 11.02 |
| <i>o</i> | —366 | —33.8 | +1007 | 42.0 | 8.93 | 9.34 | ..... | ..... |
| <i>l</i> | —341 | —31.5 | —238 | ..... | ..... | ..... | ..... | ..... |
| <i>m</i> | —330 | —31.4 | +139 | 19.9 | ..... | ..... | 11.21 | 11.62 |
| <i>k</i> | —316 | —29.2 | —235 | ..... | ..... | ..... | ..... | ..... |
| <i>h</i> | —173 | —16.0 | —229 | 15.9 | ..... | ..... | 11.80 | 12.21 |
| <i>y</i> | —117 | —10.8 | —44 | 2.5 | 13.61 | 14.02 | ..... | ..... |
| <i>x</i> | —116 | —10.7 | —26 | ..... | ..... | ..... | ..... | ..... |
| <i>w</i> | —71 | —6.6 | —31 | ..... | 12.95 | 13.36 | ..... | ..... |
| <i>β</i> | —63 | —5.8 | +22 | ..... | 14.2 | 14.6 | ..... | ..... |
| <i>α</i> | —60 | —5.5 | —8 | 0 | ..... | ..... | 13.58 | 13.99 |
| <i>b</i> | —51 | —4.7 | +206 | 34.4 | 9.53 | 9.94 | ..... | ..... |
| <i>γ</i> | —31 | —2.9 | +13 | ..... | 14.55 | 14.96 | ..... | ..... |
| <i>u</i> | —9 | —0.8 | —129 | 9.8 | 12.42 | 12.83 | ..... | ..... |
| <i>z</i> | +59 | +5.5 | —84 | 1.5 | 13.34 | 13.75 | ..... | ..... |
| <i>c</i> | +130 | +12.0 | +9 | 34.7 | 9.28 | 9.69 | ..... | ..... |
| <i>g</i> | +183 | +16.9 | —188 | 20.2 | 11.05 | 11.46 | ..... | ..... |
| <i>f</i> | +402 | +37.1 | —43 | 29.3 | 10.12 | 10.53 | ..... | ..... |
| <i>r</i> | ..... | +240 | +1140 | 54.2 | 6.85 | 7.26 | ..... | ..... |
| <i>p</i> | ..... | +269 | —70 | 46.5 | 7.89 | 8.30 | ..... | ..... |
| <i>q</i> | ..... | +346 | +320 | 48.5 | 7.67 | 8.08 | ..... | ..... |

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

| 1903 December 6. | | | 6-INCH. | | | Good; moon rising at end. | | |
|-----------------------------|------------|------------|-----------------|----------------------|------------|---------------------------|------------|-------|
| Sidereal Time. ¹ | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 23 23 | 30 | <i>D</i> | 13.8 14.1 14.1 | 14.00 | 14.07 | 0.81 | 7.70 | 8.11 |
| | | <i>E</i> | 12.3 12.0 12.2 | 12.17 | 12.17 | 0.52 | 7.41 | 7.82 |
| | 31 | <i>ra1</i> | 14.0 13.2 13.7 | 13.63 | 13.83 | 0.76 | 7.65 | 8.06 |
| | | <i>q</i> | 14.4 13.9 14.2 | 14.17 | ..... | 0.82 | 7.71 | 8.12 |
| | | <i>p</i> | 15.2 15.3 15.8 | 15.43 | ..... | 1.00 | 7.89 | 8.30 |
| | | <i>c</i> | 25.1 26.0 25.9 | 25.67 | 26.94 | 2.34 | 9.23 | 9.64 |
| | | <i>b</i> | 27.2 27.8 27.7 | 27.57 | 28.39 | 2.50 | 9.39 | 9.80 |
| | | <i>a</i> | 24.2 25.7 25.8 | 25.23 | 25.58 | 2.20 | 9.09 | 9.50 |
| | | <i>o</i> | 25.0 25.8 25.6 | 25.47 | 25.25 | 2.16 | 9.05 | 9.46 |
| | | <i>o</i> | 25.3 24.3 25.5 | 25.03 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 26.2 26.1 25.5 | 25.93 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 29.0 28.8 29.8 | 29.20 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 27.9 28.7 28.0 | 28.20 | ..... | ..... | ..... | ..... |
| | | <i>ra1</i> | 14.0 14.4 13.7 | 14.03 | ..... | ..... | ..... | ..... |
| | | <i>E</i> | 12.2 12.4 11.9 | 12.17 | ..... | ..... | ..... | ..... |
| | | <i>D</i> | 14.3 14.1 14.0 | 14.13 | ..... | ..... | ..... | ..... |
| 23 52 | 26 | | | | | | | |

RESEARCHES IN STELLAR PHOTOMETRY.

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1903 December 21. | | | 6-INCH. | | | | Good. | | |
|--------------------|------------|-----------------------|-----------------|----------------------|------------|-------|------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> 0 38 | ° 15 | <i>D</i> | 12.3 12.3 11.8 | 12.13 | 12.53 | 0.57 | 7.65 | 8.06 | |
| | | <i>E</i> | 9.8 10.4 10.0 | 10.07 | 10.57 | 0.35 | 7.43 | 7.84 | |
| | | <i>q</i> | 12.7 13.2 13.6 | 13.17 | 12.89 | 0.62 | 7.70 | 8.11 | |
| | | <i>p</i> | 15.3 14.8 14.4 | 14.83 | 14.73 | 0.90 | 7.98 | 8.39 | |
| | | <i>r_{at}</i> | 11.8 12.1 11.7 | 11.87 | 12.75 | 0.61 | 7.69 | 8.10 | |
| | | <i>f</i> | 32.3 32.7 32.4 | 32.47 | ..... | 2.99 | 10.07 | 10.48 | |
| | | <i>c</i> | 27.1 26.9 26.7 | 26.90 | 26.84 | 2.32 | 9.40 | 9.81 | |
| | | <i>v</i> | 41.0 42.1 42.0 | 41.70 | ..... | 4.00 | 11.08 | 11.49 | |
| | | <i>b</i> | 28.1 28.0 27.8 | 27.97 | 27.85 | 2.44 | 9.52 | 9.93 | |
| | 13 | <i>a</i> | 24.3 24.8 24.9 | 24.67 | 24.80 | 2.12 | 9.20 | 9.61 | |
| | | <i>o</i> | 23.2 23.7 23.9 | 23.60 | 22.92 | 1.91 | 8.99 | 9.40 | |
| | | <i>o</i> | 21.8 22.1 22.8 | 22.23 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 24.9 24.9 25.0 | 24.93 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 27.3 27.9 28.0 | 27.73 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 26.5 27.1 26.7 | 26.77 | ..... | ..... | ..... | ..... |  |
| | | <i>r_{at}</i> | 14.0 13.6 13.3 | 13.63 | ..... | ..... | ..... | ..... |  |
| | | <i>p</i> | 14.2 15.2 14.5 | 14.63 | ..... | ..... | ..... | ..... |  |
| | | <i>q</i> | 12.8 12.3 12.7 | 12.60 | ..... | ..... | ..... | ..... |  |
| | | <i>E</i> | 11.4 10.7 11.1 | 11.07 | ..... | ..... | ..... | ..... |  |
| 1 18 | 10 | <i>D</i> | 13.2 12.8 13.4 | 13.13 | ..... | ..... | ..... | ..... |  |

| 1904 October 30. | | | Quiet, dull. | | | | | |
|------------------|----|----------|----------------|-------|-------|-------|-------|-------|
| 22 48 | 37 | <i>o</i> | 27.1 28.0 27.3 | 27.60 | 27.99 | 2.56 | 8.91 | 9.32 |
| | | <i>a</i> | 30.7 30.2 30.0 | 30.30 | 30.14 | 2.73 | 9.08 | 9.49 |
| | | <i>b</i> | 32.0 32.9 33.0 | 32.63 | 32.70 | 3.02 | 9.37 | 9.78 |
| | | <i>c</i> | 31.1 31.7 31.1 | 31.30 | 31.34 | 2.84 | 9.19 | 9.60 |
| | | <i>r</i> | 10.8 10.1 10.2 | 10.37 | 10.75 | 0.36 | 6.71 | 7.12 |
| | | <i>p</i> | 18.7 19.5 19.6 | 19.27 | 18.92 | 1.47 | 7.82 | 8.23 |
| | | <i>q</i> | 16.3 17.7 17.3 | 17.10 | 16.40 | 1.14 | 7.49 | 7.90 |
| | | <i>E</i> | 17.0 17.1 17.1 | 17.07 | 16.30 | 1.12 | 7.47 | 7.88 |
| | 35 | <i>D</i> | 19.1 19.6 19.9 | 19.53 | 19.03 | 1.48 | 7.83 | 8.24 |
| | | <i>D</i> | 18.2 18.4 19.0 | 18.53 | ..... | ..... | ..... | ..... |
| | | <i>E</i> | 15.1 15.7 15.8 | 15.53 | ..... | ..... | ..... | ..... |
| | | <i>q</i> | 15.0 16.2 15.9 | 15.70 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 18.1 18.5 19.1 | 18.57 | ..... | ..... | ..... | ..... |
| | | <i>r</i> | 11.0 11.3 11.1 | 11.13 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 30.9 31.4 31.8 | 31.37 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 32.7 32.9 32.7 | 32.77 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 30.0 29.7 30.2 | 29.97 | ..... | ..... | ..... | ..... |
| 23 17 | 33 | <i>o</i> | 29.0 27.8 28.3 | 28.37 | ..... | ..... | ..... | ..... |

| 1903 November 17. | | | 12-INCH. | | | | Good. | | |
|-------------------|----|-----------------------|----------------|-------|-------|-------|-------|-------|--|
| 23 36 | 28 | <i>o</i> | 18.4 17.3 17.7 | 17.80 | 17.94 | 1.44 | 8.88 | 9.29 | |
| | | <i>a</i> | 19.0 19.4 18.7 | 19.03 | 19.08 | 1.60 | 9.04 | 9.45 | |
| | | <i>b</i> | 23.2 24.6 24.1 | 23.97 | 23.65 | 2.08 | 9.52 | 9.93 | |
| | | <i>c</i> | 21.4 21.6 21.7 | 21.57 | 20.97 | 1.80 | 9.24 | 9.66 | |
| | | <i>g</i> | 38.1 38.6 38.0 | 38.23 | 38.23 | 3.57 | 11.01 | 11.42 | |
| | | <i>f</i> | 27.5 28.6 28.4 | 28.17 | 28.54 | 2.51 | 9.95 | 10.36 | |
| | | <i>p</i> | 10.0 10.3 10.4 | 10.23 | 10.40 | 0.48 | 7.92 | 8.33 | |
| | | <i>q_{at}</i> | 15.0 14.8 14.3 | 14.70 | 15.40 | 1.10 | 8.54 | 8.95 | |
| | | <i>q_{at}</i> | 16.7 15.7 15.9 | 16.10 | ..... | ..... | ..... | ..... |  |
| | | <i>p_{at}</i> | 16.1 16.5 17.1 | 16.57 | ..... | ..... | ..... | ..... |  |
| | | <i>p</i> | 10.2 11.1 10.4 | 10.57 | ..... | ..... | ..... | ..... |  |
| | | <i>f</i> | 28.2 29.0 29.5 | 28.90 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 38.8 38.0 37.9 | 38.23 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 20.0 20.4 20.7 | 20.37 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 23.7 23.1 23.2 | 23.33 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 18.9 18.8 19.7 | 19.13 | ..... | ..... | ..... | ..... |  |
| 0 3 | 23 | <i>o</i> | 17.8 18.7 17.7 | 18.07 | ..... | ..... | ..... | ..... |  |

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1903 November 18. | | | 12-INCH. | | | | Good. | | |
|-------------------|------------|------------|-----------------|----------------------|------------|-------|----------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | <i>°</i> | | | | | | | | |
| 22 40 | 37 | <i>o</i> | 19.9 20.9 20.0 | 20.27 | 19.52 | 1.65 | 8.96 | 9.37 | |
| | | <i>a</i> | 22.1 22.9 22.7 | 22.57 | 21.14 | 1.83 | 9.14 | 9.55 | |
| | | <i>b</i> | 26.5 27.2 26.9 | 26.87 | 25.75 | 2.26 | 9.57 | 9.98 | |
| | | <i>c</i> | 22.7 23.8 23.4 | 23.30 | 22.74 | 2.00 | 9.31 | 9.72 | |
| | | <i>g</i> | 39.7 40.7 40.0 | 40.13 | 39.87 | 3.75 | 11.06 | 11.47 | |
| | | <i>f</i> | 31.9 32.1 32.7 | 32.23 | 31.95 | 2.85 | 10.16 | 10.57 | |
| | | <i>p</i> | 11.0 12.1 11.2 | 11.43 | 11.10 | 0.56 | 7.87 | 8.28 | |
| | | <i>q</i> | 9.7 9.3 9.2 | 9.40 | 9.24 | 0.37 | 7.68 | 8.09 | |
| | | <i>qa1</i> | 16.1 15.8 16.3 | 16.07 | ..... | 1.21 | 8.52 | 8.93 | |
| | | <i>p</i> | 10.7 11.0 10.6 | 10.77 | ..... | ..... | ..... | ..... |  |
| | | <i>f</i> | 31.0 32.0 31.7 | 31.57 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 39.2 40.0 39.6 | 39.60 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 21.8 22.6 22.1 | 22.17 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 24.3 24.8 24.8 | 24.63 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 19.6 20.0 19.5 | 19.70 | ..... | ..... | ..... | ..... |  |
| 23 3 | 33 | <i>o</i> | 18.3 19.1 18.9 | 18.77 | ..... | ..... | ..... | ..... |  |
| 1903 November 19. | | | Very good. | | | | | | |
| 22 24 | 39 | <i>o</i> | 18.4 18.6 18.4 | 18.47 | 18.37 | 1.50 | 8.90 | 9.31 | |
| | | <i>a</i> | 21.8 21.0 21.7 | 21.50 | 21.17 | 1.83 | 9.23 | 9.64 | |
| | | <i>b</i> | 22.9 24.0 23.5 | 23.47 | 23.47 | 2.06 | 9.46 | 9.87 | |
| | | <i>c</i> | 21.3 22.3 22.2 | 21.93 | 21.45 | 1.86 | 9.26 | 9.67 | |
| | | <i>g</i> | 37.9 39.0 38.7 | 38.53 | 38.78 | 3.64 | 11.04 | 11.45 | |
| | | <i>f</i> | 32.0 31.1 31.2 | 31.43 | 31.50 | 2.80 | 10.20 | 10.61 | |
| | | <i>p</i> | 9.8 9.8 10.0 | 9.87 | 10.04 | 0.45 | 7.85 | 8.26 | |
| | | <i>qa1</i> | 14.0 15.0 15.0 | 14.67 | 14.74 | 1.02 | 8.42 | 8.83 | |
| | | <i>qa1</i> | 15.0 14.3 15.1 | 14.80 | ..... | ..... | ..... | ..... |  |
| | | <i>p</i> | 9.3 10.3 11.0 | 10.20 | ..... | ..... | ..... | ..... |  |
| | | <i>f</i> | 32.0 31.0 31.7 | 31.57 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 39.2 38.7 39.2 | 39.03 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 20.2 21.9 20.8 | 20.97 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 22.9 23.9 23.6 | 23.47 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 19.8 21.6 21.1 | 20.83 | ..... | ..... | ..... | ..... |  |
| 22 44 | 36 | <i>o</i> | 18.2 18.5 18.1 | 18.27 | ..... | ..... | ..... | ..... |  |
| 1902 November 7. | | | 40-INCH | | | | Fair, uniform. | | |
| | | <i>f</i> | 12.1 12.7 13.6 | 12.80 | 13.60 | 0.86 | 10.12 | 10.53 | |
| | | <i>g</i> | 21.7 22.5 24.2 | 22.80 | 22.75 | 2.00 | 11.26 | 11.67 | |
| | | <i>ca2</i> | 18.2 19.8 18.8 | 18.93 | 18.97 | 1.57 | 10.83 | 11.24 | |
| | | <i>ba2</i> | 21.2 21.4 21.8 | 21.47 | 21.84 | 1.91 | 11.17 | 11.58 | |
| | | <i>z</i> | 40.7 41.8 41.3 | 41.27 | 41.97 | 3.99 | 13.25 | 13.66 | |
| | | <i>u</i> | 34.8 35.7 34.3 | 34.93 | 33.92 | 3.06 | 12.32 | 12.73 | |
| | | <i>w</i> | 39.1 38.9 38.9 | 38.97 | 39.15 | 3.68 | 12.94 | 13.35 | |
| | | <i>y</i> | 44.0 45.6 44.0 | 44.53 | 44.77 | 4.30 | 13.56 | 13.97 | |
| | | <i>λ</i> | 53.2 54.1 54.0 | 53.77 | ..... | 5.14 | 14.40 | 14.81 | |
| | | <i>v</i> | 33.8 33.2 32.9 | 33.30 | ..... | 3.00 | 12.26 | 12.67 | |
| | | <i>ly</i> | 44.2 45.0 45.8 | 45.00 | ..... | ..... | ..... | ..... |  |
| | | <i>w</i> | 38.5 39.5 40.0 | 39.33 | ..... | ..... | ..... | ..... |  |
| | | <i>u</i> | 32.2 32.8 33.7 | 32.90 | ..... | ..... | ..... | ..... |  |
| | | <i>z</i> | 42.9 42.5 42.6 | 42.67 | ..... | ..... | ..... | ..... |  |
| | | <i>ba2</i> | 22.8 21.8 22.0 | 22.20 | ..... | ..... | ..... | ..... |  |
| | | <i>ca2</i> | 18.3 19.2 19.5 | 19.00 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 23.0 22.3 22.8 | 22.70 | ..... | ..... | ..... | ..... |  |
| 6 20 | | <i>f</i> | 13.2 15.0 15.0 | 14.40 | ..... | ..... | ..... | ..... |  |

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1902 December 26. | | | 40-INCH. | | Clear; somewhat unsteady. | | | |
|------------------------|------------|-----------------------|-----------------|----------------------|---------------------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 5 50 | ° | <i>f</i> | 15.0 15.8 17.0 | 15.95 | 16.31 | 1.23 | 10.21 | 10.62 |
| | | <i>g</i> | 24.8 24.7 26.3 | 25.27 | 25.10 | 2.21 | 11.19 | 11.60 |
| | | <i>ca₂</i> | 20.0 21.4 21.6 | 21.00 | 22.35 | 1.96 | 10.94 | 11.35 |
| | | <i>ba₁</i> | 22.4 23.8 22.9 | 23.03 | 23.27 | 2.05 | 11.03 | 11.44 |
| | | <i>v</i> | 20.9 20.9 21.6 | 21.13 | ..... | 1.84 | 10.82 | 11.23 |
| | | <i>w</i> | 42.3 41.9 41.4 | 41.87 | ..... | 3.97 | 12.95 | 13.36 |
| | | <i>γ</i> | 46.7 47.3 47.9 | 47.30 | ..... | 4.54 | 13.52 | 13.93 |
| | | <i>u</i> | 37.7 38.8 38.2 | 38.23 | ..... | 3.57 | 12.55 | 12.96 |
| | | <i>z</i> | 46.2 46.0 45.9 | 46.03 | ..... | 4.44 | 13.42 | 13.83 |
| | | <i>ba₂</i> | 22.3 23.4 24.8 | 23.50 | ..... | ..... | ..... | ..... |
| | | <i>ca₂</i> | 24.5 22.8 23.8 | 23.70 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 24.2 24.8 25.8 | 24.93 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 16.0 17.8 16.2 | 16.67 | ..... | ..... | ..... | ..... |
| 1905 January 31. Good. | | | | | | | | |
| 5 30 | | <i>f</i> | 10.7 10.9 11.0 | 10.87 | 11.20 | 0.57 | 11.31 | 10.72 |
| | | <i>g</i> | 19.1 20.6 19.7 | 19.80 | 20.06 | 1.72 | 11.46 | 11.87 |
| | | <i>ca₁</i> | 5.6 6.8 7.5 | 6.63 | 6.95 | 0.16 | 9.90 | 10.31 |
| | | <i>ba₁</i> | 9.7 9.2 8.6 | 9.17 | 10.42 | 0.49 | 10.23 | 10.64 |
| | | <i>v</i> | 29.8 30.4 30.2 | 30.13 | 30.23 | 2.67 | 12.41 | 12.82 |
| | | <i>λ</i> | 53.5 53.9 53.4 | 53.60 | 52.16 | 5.00 | 14.74 | 15.15 |
| | | <i>w</i> | 35.3 36.2 36.4 | 35.97 | 35.58 | 3.25 | 12.99 | 13.40 |
| | | <i>γ</i> | 41.5 43.5 42.3 | 42.43 | 42.20 | 4.02 | 13.76 | 14.17 |
| | | <i>u</i> | 29.9 29.8 29.6 | 29.77 | 30.17 | 2.67 | 12.41 | 12.82 |
| | | <i>z</i> | 38.0 38.2 38.5 | 38.23 | 38.75 | 3.63 | 13.37 | 13.78 |
| | | <i>z</i> | 39.8 39.0 39.0 | 39.27 | ..... | ..... | ..... | ..... |
| | | <i>u</i> | 30.0 30.6 31.1 | 30.57 | ..... | ..... | ..... | ..... |
| | | <i>γ</i> | 42.1 41.7 42.1 | 41.97 | ..... | ..... | ..... | ..... |
| | | <i>w</i> | 35.2 35.3 35.1 | 35.20 | ..... | ..... | ..... | ..... |
| | | <i>λ</i> | 49.5 51.7 51.0 | 50.73 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 29.7 31.0 30.3 | 30.33 | ..... | ..... | ..... | ..... |
| | | <i>ba₁</i> | 11.5 10.8 12.7 | 11.67 | ..... | ..... | ..... | ..... |
| | | <i>ca₁</i> | 6.1 7.2 8.5 | 7.27 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 20.0 21.0 20.0 | 20.33 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 12.1 11.2 11.3 | 11.53 | ..... | ..... | ..... | ..... |
| 5 50 | 39 | <i>fa₁</i> | 17.8 18.1 17.8 | 17.90 | ..... | ..... | ..... | ..... |

TABLE 28.—787 W ANDROMEDÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|-----------------------------|------------------|-----------|------|---------------|-----------|-------------------|-----------|------|---------------|-----------|------------------|-----------|------|---------------|-----------|
| Star. | 1903 December 6. | | | | | 1903 December 21. | | | | | 1904 October 30. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| <i>D</i> | 0.81 | 7.70 | 8.11 | + .09 | - .03 | 0.57 | 7.65 | 8.06 | + .04 | - .08 | 1.48 | 7.83 | 8.24 | + .22 | + .10 |
| <i>E</i> | 0.52 | 7.41 | 7.82 | - .03 | - .10 | 0.35 | 7.43 | 7.84 | - .01 | - .08 | 1.12 | 7.47 | 7.88 | + .03 | - .04 |
| <i>r</i> | 0.01 | 6.90 | 7.31 | - .06 | + .11 | - 0.14 | 6.94 | 7.35 | - .02 | + .15 | 0.36 | 6.71 | 7.12 | - .25 | - .08 |
| Means.. | 0.45 | 7.34 | 7.75 | \pm .06 | \pm .08 | 0.26 | 7.34 | 7.75 | \pm .02 | \pm .10 | 0.99 | 7.34 | 7.75 | \pm .17 | \pm .07 |
| <i>M</i> ₀..... | .... | 6.89 | 7.30 | ... | ... | .... | 7.08 | 7.49 | ... | ... | .... | 6.35 | 6.76 | ... | ... |

| 12-INCH. | | | | | 40-INCH. | | | | |
|-----------------------------|-----------------|----------|----------|----------|-----------------------------|------------------|---------|----------|----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | |
| | | Nov. 17. | Nov. 18. | Nov. 19. | | | Nov. 7. | Dec. 26. | Jan. 31. |
| <i>o</i> | 8.98 | 1.44 | 1.65 | 1.50 | <i>b</i> | 9.53 | 0.19 | 0.33 | - 0.35 |
| <i>a</i> | 9.12 | 1.60 | 1.83 | 1.83 | <i>c</i> | 9.28 | - 0.15 | 0.24 | - 0.68 |
| <i>p</i> | 7.90 | 0.48 | 0.56 | 0.45 | <i>f</i> | 10.12 | 0.86 | 1.23 | 0.57 |
| <i>q</i> | 7.63 | 0.26 | 0.37 | 0.18 | <i>g</i> | 11.05 | 2.00 | 2.21 | 1.72 |
| Mean C... | .... | 0.95 | 1.10 | 1.20 | Mean C... | .... | 0.72 | 1.00 | 0.32 |
| Mean Mag. | 8.41 | 8.41 | 8.41 | 8.41 | Mean Mag. | 10.00 | 10.00 | 10.00 | 10.00 |
| <i>M</i> ₀..... | .... | 7.46 | 7.31 | 7.42 | <i>M</i> ₀..... | .... | 9.28 | 9.00 | 9.68 |

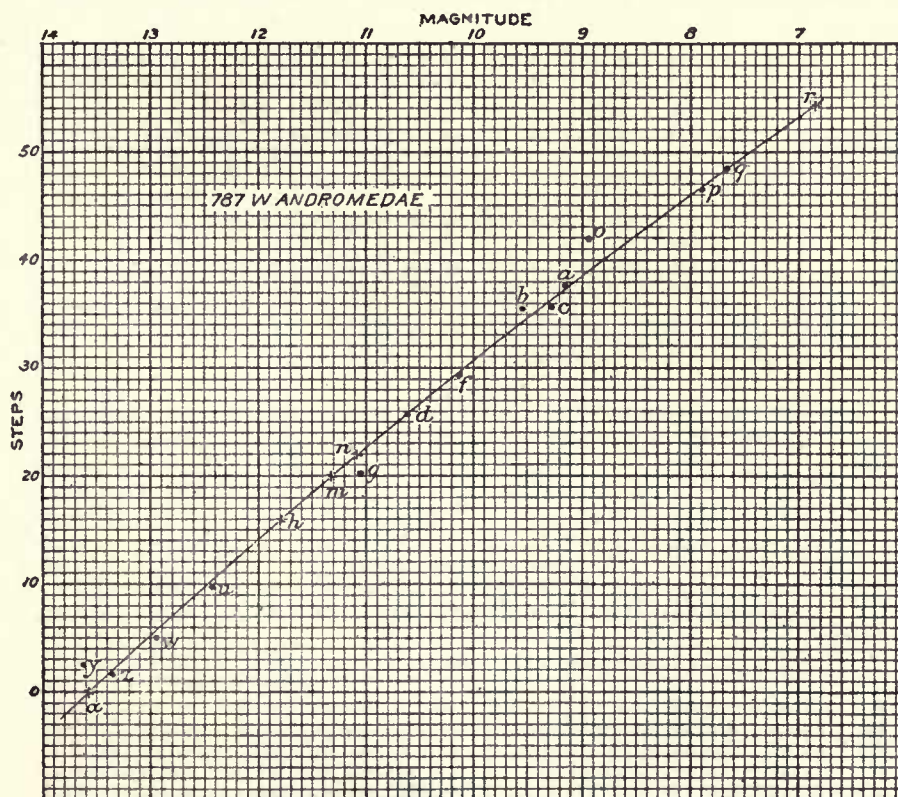


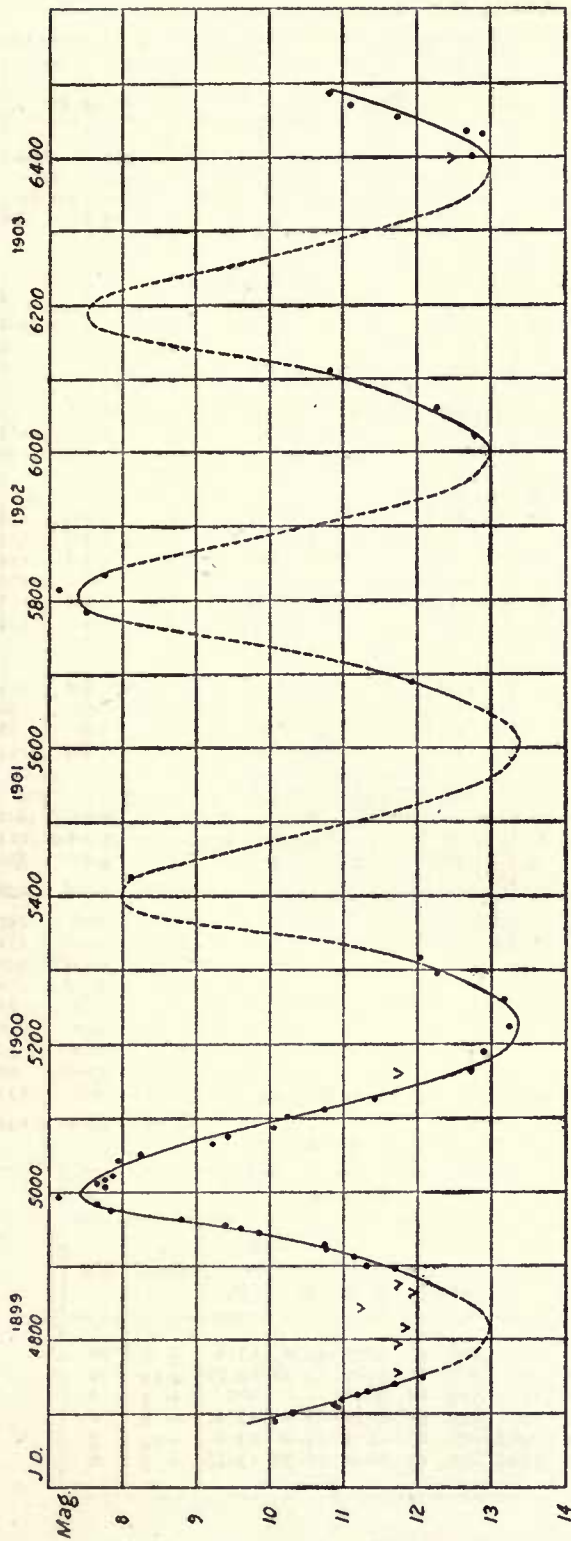
FIG 10.—MAGNITUDE-CURVE FOR W ANDROMEDÆ.

TABLE 30.—787 W ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|----------------------|---------|-----------|-------------------------------|------------------------|--------|-------|---------|-------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day, G. M. T. | | | | | Steps. | Mag. | | | |
| | 1899 | | 2410000+ | | | | | | | | | |
| 1 | Feb. 6 | 7 | 4692.54 | 80 | 6 | b4-5v, c4-5v, vf, v3-4d, asb. | 29.9, 30.2, 29.3, 29.3 | 29.7 | 10.06 | good | 0 | +0.08 |
| 2 | 15 | 7 | 4701.54 | 150 | 6 | c4-5v, f2v, v1d, v very red. | 30.2, 27.3, 26.8 .. | 28.1 | 10.31 | moon | 9 | +0.04 |
| 3 | 24 | 7 | 4710.54 | 150 | 6 | d3-4v, f6v, v3-4g | 22.3, 23.3, 23.7 .. | 23.1 | 10.92 | fair | 18 | +0.31 |
| 4 | 28 | 8 | 4714.56 | 150 | 6 | f6v, vd, v2g | 23.3, 25.8, 22.2 .. | 23.7 | 10.88 | good | 22 | +0.18 |
| 5 | Mar. 6 | 8 | 4720.56 | 150 | 6 | f6-8v, d2v, v2g | 22.3, 23.8, 22.2 .. | 22.7 | 10.98 | good | 28 | +0.03 |
| 6 | 13 | 8 | 4727.56 | 150 | 6 | d5v, vg, v2m | 20.8, 20.2, 21.9 .. | 20.9 | 11.20 | good | 35 | -0.01 |
| 7 | 18 | 8 | 4732.56 | 150 | 6 | d7-8v, gv, v1m | 18.3, 20.2, 20.9 .. | 19.8 | 11.32 | fair | 40 | -0.09 |
| 8 | 28 | 8 | 4742.56 | 150 | 6 | g4v, m3v, v1h | 16.2, 16.9, 16.9 .. | 16.6 | 11.71 | good | 50 | -0.04 |
| 9 | Apr. 4 | 8 | 4749.56 | 150 | 6 | h1-2v, limit v ..... | ..... | 14.4 | 12.08 | fair | 57 | +0.10 |
| 10 | 12 | 8 | 4757.56 | 150 | 6 | v not seen, limit c ..... | ..... | <16 | <11.8 | fair | ..... | ..... |
| 11 | May 21 | 15 | 4796.88 | 150 | 6 | v not seen, h glimpsed ..... | ..... | <16 | <11.8 | fair | ..... | ..... |
| 12 | June 10 | 15 | 4816.88 | 150 | 6 | v not seen, limit i < h ..... | ..... | <15 | <11.9 | good | ..... | ..... |
| 13 | July 5 | 15 | 4841.88 | ..... | 6 | v not seen, limit m ..... | ..... | <20 | <11.3 | poor | ..... | ..... |
| 14 | 29 | 10 | 4865.67 | 150 | 6 | v not seen, limit 2 < h ..... | ..... | <14 | <12.0 | good | ..... | ..... |
| 15 | Aug. 10 | 9 | 4877.63 | 150 | 6 | v not seen, limit h ..... | ..... | <16 | <11.8 | fair | ..... | ..... |
| 16 | 30 | 9 | 4897.63 | 150 | 6 | g3v, v0-1h | 17.2, 16.4 | 16.8 | 11.70 | fair | 205 | -0.07 |
| 17 | Sept. 4 | 9 | 4902.61 | 150 | 6 | v1g, v2-3h, n2v | 21.2, 18.4, 19.8 .. | 19.8 | 11.32 | fair | 210 | -0.31 |
| 18 | 13 | 8 | 4911.58 | 150 | 6 | v1g, v1m, vn, d4-5v | 21.2, 20.9, 21.8, 21.3 | 21.3 | 11.15 | fair | 219 | -0.35 |
| 19 | 25 | 7 | 4923.54 | 150 | 6 | d1-2v, v4m, v4g | 24.3, 23.9, 24.2 .. | 24.4 | 10.78 | fair | 231 | -0.15 |
| 20 | Oct. 2 | 8 | 4930.58 | 150 | 6 | d1v, v4-5m, v4-5g | 24.8, 24.4, 24.7 .. | 24.6 | 10.76 | good | 238 | +0.13 |
| 21 | 18 | 7 | 4946.54 | 80 | 6 | b4v, c4v, v8-10d | 30.4, 30.7, 34.8 .. | 31.9 | 9.85 | poor | 254 | -0.03 |
| 22 | 23 | 7 | 4951.54 | 150 | 6 | c1v, vb, v4-5f | 33.9, 34.4, 33.8 } | 33.9 | 9.60 | good | 259 | -0.03 |
| 23 | 28 | 7 | 4956.54 | 40 | 6 | c1v, b0-1v, v5f | 33.7, 33.9, 34.3 } | 36.5 | 9.40 | good | 264 | +0.10 |
| 24 | Nov. 4 | 8 | 4963.56 | 40 | 6 | v1c, a0-1v | 35.7, 37.3 | 40.1 | 8.80 | good | 271 | -0.09 |
| 25 | 15 | 7 | 4974.54 | 40 | 6 | v3c, v3a, v0 | 37.7, 40.8, 42.0 .. | 47.5 | 7.84 | fair | 282 | -0.28 |
| 26 | 26 | 7 | 4985.52 | 40 | 6 | v10c, v9a, v80 ±, v2p, q1v. { | 44.7, 46.8, 50.0 } | 48.5 | 7.66 | good | 293 | -0.19 |
| 27 | Dec. 4 | 7 | 4993.54 | 40 | 6 | v3p, r6v, v2q | 48.5, 47.5 | 48.5 | 7.16 | good | 301 | -0.54 |
| 28 | 19 | 7 | 5008.54 | 40 | 6 | r0-1v, v6p | 49.5, 46.2, 50.5 .. | 52.1 | 7.78 | good | 316 | +0.23 |
| 29 | 23 | 7 | 5012.54 | 40 | 6 | r5v, v2p | 51.7, 52.5 | 47.8 | 7.76 | good | 320 | +0.08 |
| 30 | 29 | 7 | 5018.54 | 40 | 6 | r4v, v3-4p, v60 | 47.2, 48.5 | 48.7 | 7.77 | good | 326 | +0.10 |
| | 1900 | | | | | | | | | | | |
| 31 | Jan. 4 | 7 | 5024.54 | 40 | 6 | r4-5v, v1-2p, v60 | 47.7, 48.0, 48.0 .. | 47.9 | 7.77 | good | 326 | +0.10 |
| 32 | 22 | 7 | 5042.54 | 40 | 6 | v60, v2-3p, r8v | 48.0, 49.0, 44.2 .. | 47.0 | 7.89 | good | 332 | +0.09 |
| 33 | 31 | 7 | 5051.52 | 40 | 6 | v1p, v3-40 | 47.5, 45.5 | 46.5 | 7.95 | good | 350 | -0.36 |
| 34 | Feb. 16 | 7 | 5067.54 | 40 | 6 | v2p, v20 | 44.5, 44.0 | 44.2 | 8.27 | good | 359 | -0.33 |
| 35 | 25 | 8 | 5076.58 | 80 | 12 | o5v, a2v, v2b, v3c | 37.0, 35.8, 36.4 } | 36.8 | 9.22 | good | 375 | +0.10 |
| 36 | Mar. 9 | 7 | 5088.54 | 150 | 6 | v2b, v3c | 37.7, 36.4, 37.7 .. | 35.3 | 9.42 | good | 384 | -0.04 |
| 37 | 22 | 7 | 5101.54 | 80 | 12 | a1-2v, vb | 36.3, 34.4 | 30.3 | 10.06 | good | 0 | +0.04 |
| 38 | 31 | 8 | 5110.56 | 40 | 6 | b4v, vf, v5-6d | 30.4, 29.3, 31.3 .. | 28.8 | 10.23 | fair | 13 | -0.17 |
| 39 | Apr. 17 | 9 | 5127.61 | 150 | 6 | vf, v2-3d | 29.3, 28.3 | 24.7 | 10.73 | good | 22 | +0.03 |
| 40 | May 20 | 14 | 5160.83 | 150 | 6 | f4-5v, v1d | 24.8, 26.8 | 19.0 | 11.41 | low | 39 | +0.04 |
| 41 | 28 | 14 | 5168.83 | 275 | 12 | f5v, d1v, v3m | 24.3, 24.8, 22.9 } | <15.9 | <11.8 | low | ..... | ..... |
| 42 | June 19 | 14 | 5190.83 | 350 | 40 | g1v, v3h | 19.2, 18.9 | 7.7 | 12.73 | ..... | 80 | +0.14 |
| 43 | July 25 | 15 | 5226.88 | 460 | 40 | v not seen, limit h ..... | ..... | 6.1 | 12.90 | moon | 102 | +0.02 |
| 44 | Aug. 29 | 15 | 5261.88 | 460 | 40 | h8-10v, u0-1v, v2w | 6.9, 9.3, 7.0 | 3.0 | 13.23 | fair | 138 | +0.30 |
| 45 | Oct. 4 | 8 | 5297.58 | 237 | 40 | u2v, v1w, v2y, limit y | 7.8, 6.0, 4.5 | 3.6 | 13.18 | ..... | 173 | +0.70 |
| 46 | 25 | 7 | 5318.52 | 67 | 12 | w2-3v, v1-2z, u5-6v, vy | 2.5, 3.0, 4.3 2.5 } | 11.8 | 12.27 | moon | 209 | +0.62 |
| | 1901 | | | | | | | | | | | |
| 47 | Feb. 9 | 7 | 5425.54 | 40 | 6 | u6-8v, w1v, v4a, v2z, v1-2y { | 2.8, 4.0, 4.0 | 13.8 | 12.02 | good | 230 | +0.07 |
| | | | | | | v2u | 3.5, 4.0 | 45.2 | 8.11 | fair | 337 | +0.17 |
| | | | | | | v4u, h2v | 13.8, 13.9 | | | | | |

TABLE 30.—787 W ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|-----------------|---------------|----------------------|---------|-----------|--|-----------------------------|--------|--------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day, G. M. T. | | | | | Steps. | Mag. | | | |
| 48 | 1901 Nov. 1 | 7 | 2410000+ 5690.54 | 275 | 12 | (<i>vh</i> , <i>v4u</i>) limit 3-4 < <i>u</i> , or 2 < <i>w</i> , (or 2 < <i>x</i>) | 15.9, 13.8 | 14.8 | 11.92 | good | 206 | +0.18 |
| 49 | 1902 Jan. 12 | .. | 5762 | ... | 24 | photograph..... | ..... | ..... | ..... | ..... | 278 | .... |
| 50 | Feb. 4 | .. | 5785 | 237 | 40 | <i>v</i> very bright and very red ..... | ..... | ..... | 7.8 | ..... | 301 | .... |
| 51 | Mar. 4 | .. | 5813 | 67 | 12 | photometer..... | ..... | ..... | 7.11 | ..... | 329 | -0.63 |
| 52 | 27 | .. | 5836 | 67 | 12 | photometer..... | ..... | ..... | 7.75 | ..... | 352 | -0.61 |
| 53 | Apri 2 | .. | 5842 | 67 | 12 | photometer..... | ..... | ..... | ..... | ..... | ... | .... |
| 54 | Oct. 1 | 9 | 6023.63 | 237 | 40 | <i>u2-3v</i> , <i>v2-3w</i> | 7.3, 7.5 | 7.4 | 12.77 | poor | 143 | -0.13 |
| 55 | Nov. 7 | .. | 6061 | 237 | 40 | photometer..... | ..... | ..... | 12.24 | ..... | 181 | -0.10 |
| 56 | Dec. 26 | .. | 6110 | 237 | 40 | photometer..... | ..... | ..... | 10.80 | ..... | 230 | -0.15 |
| 57 | 1903 Oct. 11 | 7 | 6399.54 | 150 | 6 | <i>v</i> not seen, limit <i>u</i>..... | ..... | < 10 | < 12.5 | good | 123 | .... |
| 58 | 13 | 9 | 6401.63 | 80 | 12 | <i>u1v</i> , <i>v4z</i> | 8.8, 5.5 | 7.7 | 12.72 | good | 125 | -0.27 |
| 59 | Nov. 11 | .. | 6430 | 67 | 12 | photometer, also <i>u3-4v</i>... | ..... | 6.3 | 12.88 | good | 154 | +0.10 |
| 60 | 17 | 10 | 6436.67 | 67 | 12 | photometer, also <i>u1v</i> , <i>v6z</i> .. | 8.8, 7.5 | 8.4 | 12.66 | good | 160 | -0.04 |
| 61 | Dec. 6 | 7 | 6554.54 | 40 | 6 | photometer, also <i>g4v</i> , <i>v1h</i> .. | 16.2, 16.9 | 16.6 | 11.71 | good | 178 | -0.68 |
| 62 | 21 | 7 | 6470.54 | 40 | 6 | photometer..... | ..... | ..... | 11.08 | good | 194 | -0.97 |
| 63 | 1904 Jan. 8 | 7 | 6488.54 | 67 | 12 | <i>f2-3v</i> , <i>v1-2g</i> | 26.8, 21.7 | 24.2 | 10.80 | good | 212 | -0.79 |
| 64 | Aug. 29 | 8 | 6722.58 | 150 | 6 | <i>g3v</i>..... | ..... | 17.2 | 11.63 | fair | 50 | -0.12 |
| 65 | Oct. 6 | 11 | 6760.71 | 40 | 6 | <i>v</i> not seen, limit <i>h</i>..... | ..... | < 16 | < 11.8 | fine | 88 | .... |
| 66 | 30 | 9 | 6784.63 | 450 | 40 | <i>w1v</i> , <i>v3a</i> | 4.0, 3.0 | 3.5 | 13.19 | good | 112 | +0.24 |
| 67 | 1905 Jan. 28 | 9 | 6874.63 | 237 | 40 | photometer..... | ..... | ..... | 12.05 | good | 202 | +0.20 |
| 68 | Feb. 9 | 8 | 6886.58 | 275 | 12 | <i>v</i> not seen, <i>u</i> glimpsed .. | ..... | < 10 | < 12.5 | poor | 214 | .... |
| 69 | 25 | 8 | 6902.56 | 237 | 40 | <i>vg</i> , <i>v4-5u</i> , <i>v2-3h</i> , <i>h4u</i> ... | 20.2, 14.2, 18.4 .. | 18.3 | 11.50 | good | 230 | +0.60 |
| 70 | Mar. 3 | 7 | 6908.54 | 67 | 12 | <i>g6v</i> , <i>v2h</i> , <i>c2b</i> | 14.2, 17.9 | 16.7 | 11.70 | good | 236 | +1.00 |
| 71 | 24 | 7 | 6929.54 | 275 | 12 | <i>w, x, y</i> and <i>z</i> seen, <i>a</i> glimpsed | ..... | ..... | ..... | ..... | ... | .... |
| 72 | Apr. 7 | 8 | 6943.58 | 150 | 6 | <i>f4-5v</i> , <i>v2-3g</i> | 24.8, 23.7 | 24.2 | 10.80 | fair | 257 | +1.15 |
| 73 | June 13 | 15 | 7010.83 | 40 | 6 | <i>c1v</i> <i>v1b</i> , <i>v5f</i> | 33.7, 35.4, 34.3... | 34.5 | 9.51 | good | 271 | +0.73 |
| 74 | Aug. 9 | 15 | 7067.83 | 20 | 5 | <i>vp±</i>..... | ..... | 46.5 | 7.95± | good | 338 | +0.23 |
| 75 | 28 | 9 | 7086.64 | 150 | 6 | <i>f3-4v</i> , <i>v4g</i> , <i>c2-3b</i> | 25.8, 24.2 | 25.0 | 10.71 | good | 0 | +0.81 |
| 76 | Sept. 17 | 8 | 7106.58 | 150 | 6 | <i>d2-3v</i> , <i>v2g</i> , <i>f5-6v</i> , <i>c2b</i> | 23.3, 22.2, 23.8 .. | 23.1 | 10.94 | fair | 18 | +0.34 |
| 77 | Oct. 1 | 9 | 7120.63 | 150 | 6 | <i>g4-5v</i> , <i>v1h</i> | 15.7, 16.9 | 16.5 | 11.73 | fair | 38 | +0.38 |
| 78 | 20 | 8 | 7137.54 | 237 | 40 | <i>h4v</i> , <i>v4u</i> | 11.9, 13.8 | 12.8 | 12.15 | fair | 52 | +0.30 |
| 79 | Dec. 23 | 10 | 7203.70 | 80 | 12 | <i>h5v</i> , <i>v1-2u</i> | 10.9, 11.3 | 11.2 | 12.33 | good | 69 | 0.00 |
| 80 | 30 | 9 | 7210.63 | 237 | 40 | <i>a1v</i> , <i>v4β</i> , <i>v5γ</i> | -1.0, -2.0, -5.0. | -2.2 | 13.81 | fair | 135 | +0.82 |
| | | | | | | <i>z4v</i> , <i>a3v</i> , <i>v5β</i> , <i>v5γ</i> | -2.5, -3.0, -1.0, } -5.0 | -2.9 | 13.88 | good | 142 | +0.92 |



787 W ANDROMEDÆ

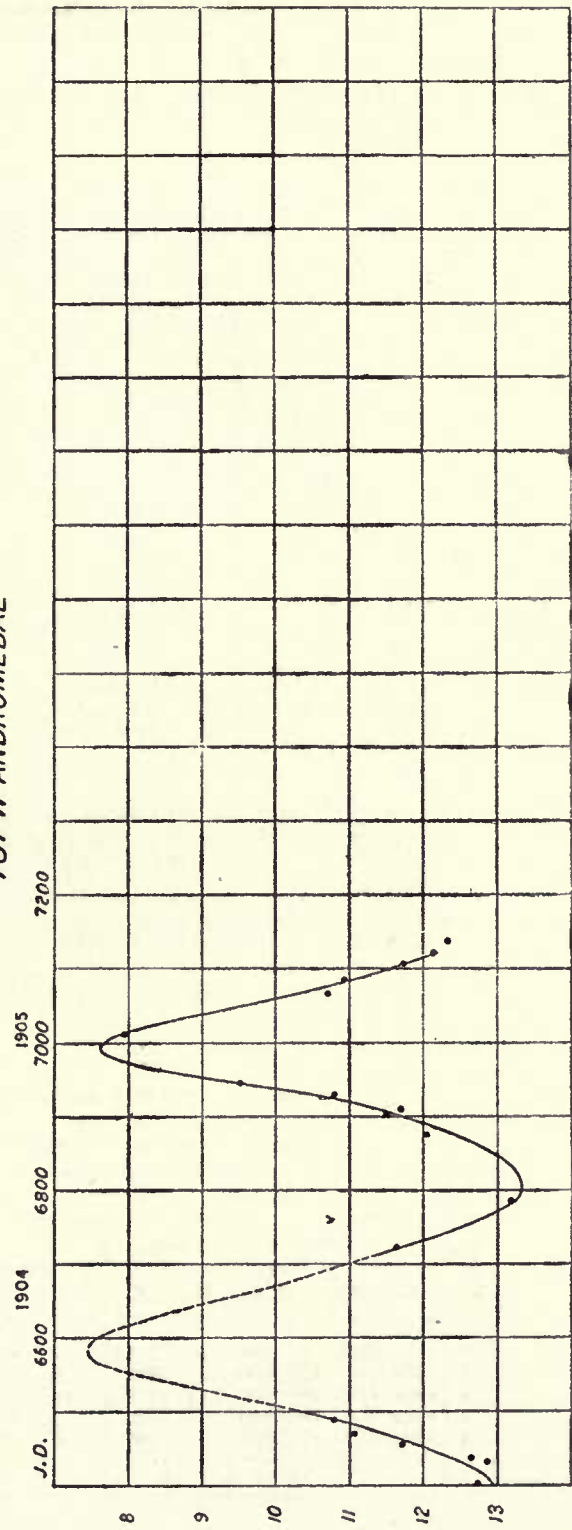


FIG. 11.—LIGHT-CURVE OF W ANDROMEDÆ.

TABLE 31.—MEAN MAGNITUDES FROM 33 DAY GROUPS.

| Group No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-------------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D. | 33 | 66 | 99 | 132 | 165 | 198 | 231 | 264 | 297 | 330 | 363 | 396 |
| 4692 { | <i>t</i> | 15 | 46 | .... | .... | .... | 211 | 246 | 278 | 316 | 347 | 380 |
| | <i>M</i> | 10.63 | 11.58 | .... | .... | .... | 11.39 | 10.25 | 8.42 | 7.9 | 8.04 | 9.32 |
| | ΔM | +0.13 | -0.01 | .... | .... | .... | -0.24 | -0.02 | -0.12 | -0.03 | -0.20 | +0.03 |
| | No. | 5 | 4 | .... | .... | .... | 3 | 4 | 4 | 4 | 3 | 3 |
| 5088 { | <i>t</i> | 12 | 39 | 80 | 102 | 138 | 173 | 220 | .... | 337 | .... | .... |
| | <i>M</i> | 10.34 | 11.41 | 12.73 | 12.90 | 13.23 | 13.18 | 12.14 | .... | 8.11 | .... | .... |
| | ΔM | -0.03 | +0.04 | +0.14 | +0.02 | +0.30 | +0.70 | +0.34 | .... | +0.17 | .... | .... |
| | No. | 3 | 1 | 1 | 1 | 1 | 1 | 2 | .... | 1 | .... | .... |
| 5484 { | <i>t</i> | .... | .... | .... | .... | .... | 206 | .... | .... | 329 | 352 | .... |
| | <i>M</i> | .... | .... | .... | .... | .... | 11.92 | .... | .... | 7.11 | 7.75 | .... |
| | ΔM | .... | .... | .... | .... | .... | +0.18 | .... | .... | -0.63 | -0.61 | .... |
| | No. | .... | .... | .... | .... | .... | 1 | .... | .... | 1 | 1 | .... |
| 5880 { | <i>t</i> | .... | .... | .... | .... | 143 | 181 | 230 | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | 12.77 | 12.24 | 10.80 | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | -0.13 | -0.10 | -0.15 | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | 1 | 1 | 1 | .... | .... | .... | .... |
| 6276 { | <i>t</i> | .... | .... | .... | 125 | 157 | 186 | 212 | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | 12.72 | 12.77 | 11.40 | 10.80 | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | -0.27 | +0.03 | -0.82 | -0.79 | .... | .... | .... | .... |
| | No. | .... | .... | .... | 1 | 2 | 2 | 1 | .... | .... | .... | .... |
| 6672 { | <i>t</i> | .... | 50 | .... | 112 | .... | .... | 216 | .... | .... | .... | .... |
| | <i>M</i> | .... | 11.63 | .... | 13.19 | .... | .... | 11.78 | .... | .... | .... | .... |
| | ΔM | .... | -0.12 | .... | +0.24 | .... | .... | +0.40 | .... | .... | .... | .... |
| | No. | .... | 1 | .... | 1 | .... | .... | 2 | .... | .... | .... | .... |
| Means { | <i>t</i> | 14 | 45 | 80 | 113 | 146 | 180 | 216 | 246 | 278 | 327 | 350 |
| | <i>M</i> | 10.48 | 11.54 | 12.73 | 12.94 | 12.92 | 12.27 | 11.47 | 10.25 | 8.42 | 7.60 | 7.90 |
| | ΔM | +0.07 | +0.02 | +0.14 | 0.00 | +0.06 | -0.31 | 0.00 | -0.02 | -0.12 | -0.10 | -0.30 |
| | No. | 8 | 6 | 1 | 3 | 4 | 4 | 10 | 4 | 4 | 6 | 4 |

TABLE 32.—787 W ANDROMEDÆ. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1899 Dec. 16 (J. D. 2415005)+396¹ E. $M - m = 192^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|------|------|-------|-----|---------|---------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 0 | 1899 Dec. 7 | 4996 | 7.42 | 7.83 | - 9 | 27 | 0 | 1899 June 16 | 4819 | 13.0 | 13.4 | + 6 | 20 |
| 1 | 1901 Jan. 15 | 5400 | .... | mc | - 1 | 1 | 1 | 1900 July 23 | 5224 | 13.36 | 13.77 | +15 | 9 |
| 2 | 1902 Feb. 28 | 5809 | 7.4 | 7.8 | +12 | 4 | 2 | 1901 Aug. 13 | 5610 | .... | mc | + 5 | 1 |
| 3 | 1903 Mar. 16 | 6190 | .... | mc | - 3 | 1 | 3 | 1902 Aug. 31 | 5993 | 13.0 | 13.4 | - 8 | 2 |
| 4 | 1904 Apr. 17 | 6588 | .... | mc | - 1 | 1 | 4 | 1903 Sept. 25 | 6383 | 13.0 | 13.4 | -14 | 5 |
| | | | | | | | 5 | 1904 Nov. 15 | 6800 | 13.34 | 13.75 | + 7 | 6 |

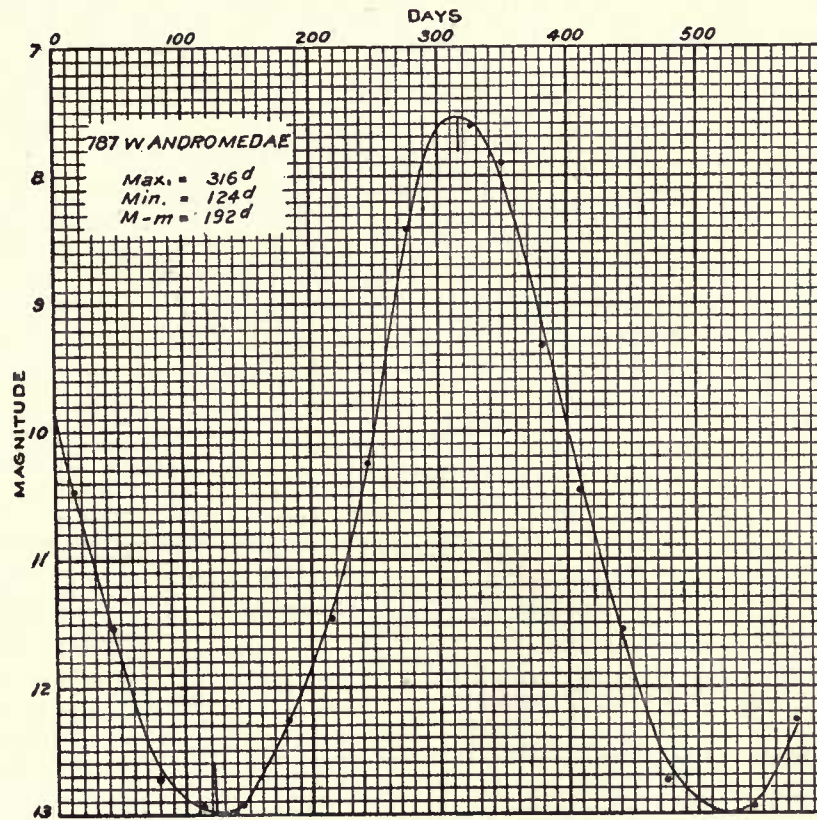


FIG. 12.—MEAN LIGHT-CURVE OF W ANDROMEDÆ.

CHAPTER V.

4315 R COMÆ.

R. A. 11h 59m 8.4s; Dec. + 19° 20' 19" (1900).

Discovered by Schönfeld in 1856, this might almost be called a historic star, but the published observations were so fragmentary in character that more work was needed. The period was found to be only a few days less than a year, and the maximum so near conjunction with the sun that comparisons were uncertain in the twilight, while the beginning of the descending branch of the light curve was lost in the daylight, and it appears that no one had followed it in the morning sky, or continued observations through the minimum. The present observations, when combined into the mean curve, figure 15, cover the entire period, and seem to show that the time of maximum is about 20 days later than that found from evening observations alone. The maxima numbered 40, 41, 42, 44, and 48 are well covered with observations on both branches of the curve, but the twilight renders it difficult to fix the exact magnitude at maximum; it can only be stated as about 8.5, with the evidence insufficient to say whether it changes from one maximum to another. The minima, on the contrary, can be well followed, the three best observed, numbers 44, 46, and 49, giving a magnitude a few tenths brighter than 14.

The faint stars with the Greek letters, α , and the variable were connected with the bright star *F* (B. D. + 19° 2526) in February and March, 1900, with the micrometer on the 40-inch. The place of the variable given above results from the Berlin A. G. Catalogue position of the star *F*.

4315 R COMÆ.

TABLE 33.—STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|----------|-----------|--------------|----------|-----------------|------------|-------|-----------|------|------------|-----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P.DM. | H. | P. | H. | P. | |
| <i>A</i> | ° | <i>h m s</i> | ° ' | | | | | | | | |
| <i>B</i> | +18 2539 | 11 49 00 | +18 43.4 | WG | 7.76 | 8.16 | 7.89 | 8.19 | +13 | + 3 | ± 6 |
| <i>F</i> | +18 2546 | 11 52 35 | +18 01.6 | GW | 6.91 | 7.04 | 6.81 | 7.11 | -10 | + 7 | ± 7 |
| | +19 2526 | 11 58 57 | +19 23.1 | G— | 7.64 | 8.02 | 7.62 | 7.92 | - 2 | -10 | ± 4 |
| | Mean ... | ..... | ..... | ..... | 7.44 | 7.74 | 7.44 | 7.74 | ± 8 | ± 7 | ± 6 |

TABLE 34.—4315 R COMÆ. COMPARISON STARS IN B. D. CATALOGUE.

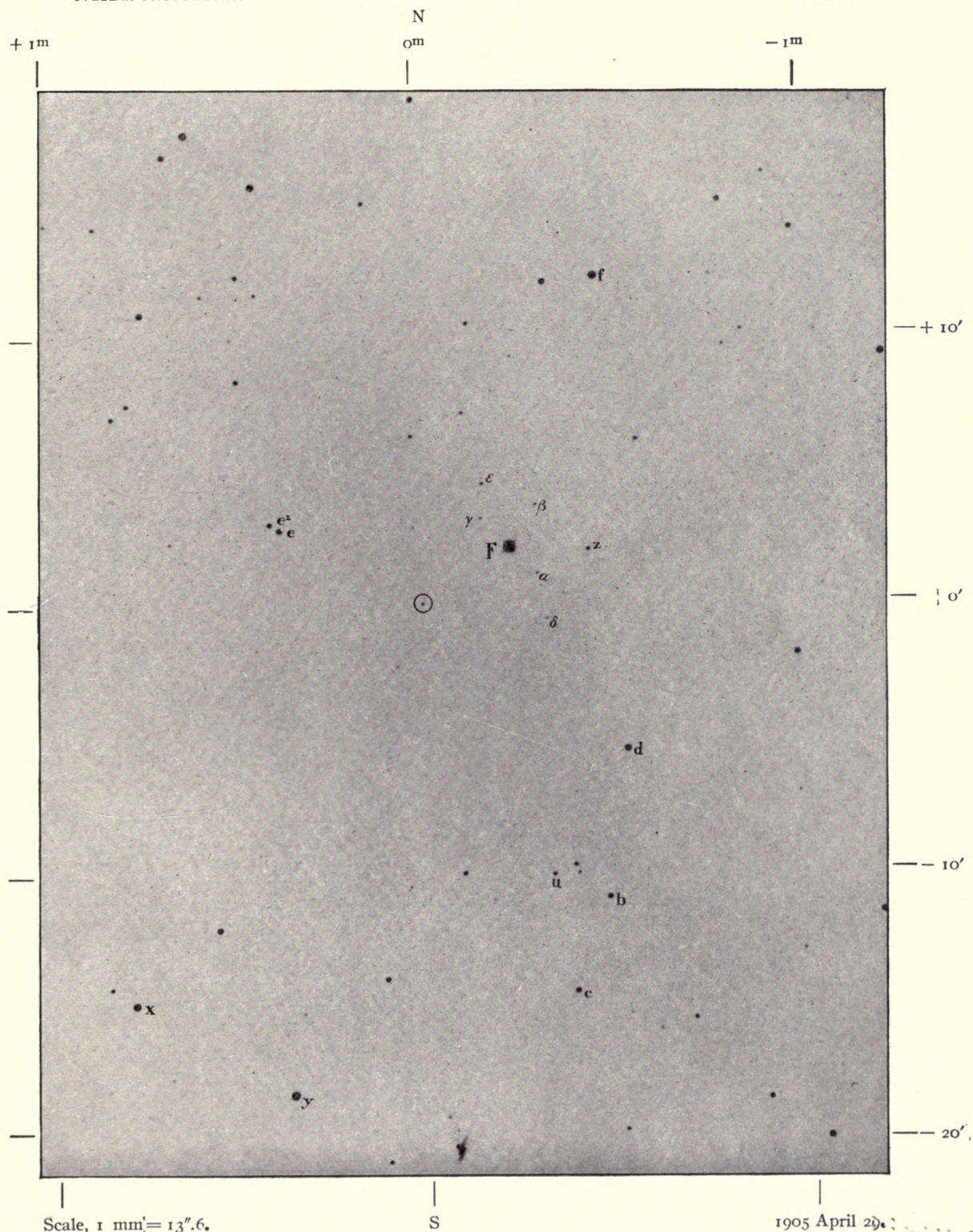
| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|----------|------|--------------|----------|-----------|----------|------|--------------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | | | | | | | | | |
| | ° | | <i>h m s</i> | ° ' " | | ° | | <i>h m s</i> | ° ' " |
| <i>U</i> | +19 2522 | 9.1 | 11 54 2 | +19 59.1 | <i>1U</i> | +19 2525 | 9.1 | 11 55 15 | +19 38.3 |
| <i>a</i> | +20 2670 | 8.6 | 11 54 58 | +20 5.5 | <i>P</i> | +20 2676 | 8.4 | 11 56 25 | +20 11.8 |
| <i>R</i> | +19 2524 | 8.8 | 11 55 9 | +19 20.4 | <i>H</i> | +20 2683 | 7.8 | 11 59 59 | +20 10.1 |

TABLE 35.—COMPARISON STARS FOR R COMÆ.

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|----------------------|----------------------------|----------|----------|---------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | <i>h</i> | <i>m</i> | <i>s</i> | | H. | P. | H. | P. |
| <i>U</i> | 2390 | 168.8 | +1454 | .... | 9.77 | 10.07 | ..... | ..... |
| <i>a</i> | 1589 | 112.3 | +1772 | 40.9 | 9.09 | 9.39 | ..... | ..... |
| <i>R</i> | 1454 | 102.4 | — 900 | 39.0 | 9.15 | 9.45 | ..... | ..... |
| <i>1U</i> | 1328 | 93.9 | + 289 | 32.6 | 10.14 | 10.44 | ..... | ..... |
| <i>d</i> | 453 | 32.0 | — 329 | 25.4 | 10.67 | 10.97 | ..... | ..... |
| <i>b</i> | 408 | 28.8 | — 658 | 17.1 | 12.29 | 12.59 | ..... | ..... |
| <i>f</i> | 404 | 28.5 | + 735 | 26.4 | 10.57 | 10.87 | ..... | ..... |
| <i>c</i> | 336 | 23.7 | — 869 | 18.6 | 12.43 | 12.73 | ..... | ..... |
| <i>z</i> | 379 | 26.8 | + 124 | 11.3 | 12.83 | 13.13 | ..... | ..... |
| <i>P</i> | 359 | 25.4 | +2160 | 44.2 | ..... | ..... | 8.57 | 8.87 |
| <i>u</i> | 289 | 20.4 | — 609 | .... | 12.81 | 13.11 | ..... | ..... |
| <i>δ</i> | 281 | 19.9 | — 34 | 0 | 14.70 | 15.00 | ..... | ..... |
| <i>a</i> | 263 | 18.6 | + 71 | 3.0 | 14.08 | 14.38 | ..... | ..... |
| <i>β</i> | 259 | 18.3 | + 226 | 4.0 | 14.08 | 14.38 | ..... | ..... |
| <i>F</i> | 199 | 14.1 | + 130 | 52.9 | 7.62 | 7.92 | ..... | ..... |
| <i>ε</i> | 138 | 9.7 | + 273 | 9.0 | 13.19 | 13.49 | ..... | ..... |
| <i>γ</i> | 136 | 9.6 | + 194 | 4.0 | 14.17 | 14.47 | ..... | ..... |
| <i>e</i> | + 327 | + 23.1 | + 171 | 21.3 | ..... | ..... | 11.47 | 11.77 |
| <i>e^u</i> | + 352 | + 24.9 | + 185 | 16.3 | ..... | ..... | 12.16 | 12.46 |
| <i>H</i> | .... | + 190 | +2058 | 49.2 | ..... | ..... | 7.98 | 8.28 |

TABLE 36.—4315 R COMÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

| 1904 July 4. | | | 6-INCH. | | | | Fair. | |
|----------------|------------|-----------------------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | ° | <i>v</i> | 26.8 26.8 27.9 | 27.17 | 27.84 | 2.44 | 9.59 | 9.89 |
| 16 14 | | <i>R</i> | 27.9 28.6 28.7 | 28.40 | 27.60 | 2.41 | 9.56 | 9.86 |
| | 59 | <i>a</i> | 25.4 24.8 24.9 | 25.03 | 23.65 | 2.01 | 9.16 | 9.46 |
| | | <i>U</i> | 27.2 27.1 28.2 | 27.50 | 27.12 | 2.36 | 9.51 | 9.81 |
| | 60— | <i>D_{a1}</i> | 14.0 13.9 13.8 | 13.90 | 14.27 | 0.83 | 7.98 | 8.28 |
| | | <i>1U</i> | 31.4 32.4 31.9 | 31.90 | 32.57 | 3.00 | 10.15 | 10.45 |
| | | <i>F</i> | 10.9 10.4 10.7 | 10.67 | 11.19 | 0.42 | 7.57 | 7.87 |
| | | <i>B_{a1}</i> | 9.8 10.1 11.1 | 10.33 | 10.98 | 0.38 | 7.53 | 7.83 |
| | 63 | <i>A</i> | 14.1 14.7 14.3 | 14.37 | 14.29 | 0.83 | 7.98 | 8.28 |
| | | <i>A</i> | 14.2 14.0 14.4 | 14.20 | ..... | ..... | ..... | ..... |
| | 63+ | <i>B_{a1}</i> | 11.9 11.1 11.9 | 11.63 | ..... | ..... | ..... | ..... |
| | 62— | <i>F</i> | 12.0 11.2 11.9 | 11.70 | ..... | ..... | ..... | ..... |
| | 62+ | <i>1U</i> | 33.8 32.9 33.0 | 33.23 | ..... | ..... | ..... | ..... |
| | 63 | <i>D_{a1}</i> | 15.0 14.2 14.7 | 14.63 | ..... | ..... | ..... | ..... |
| | 63 | <i>U</i> | 26.4 26.9 26.9 | 26.73 | ..... | ..... | ..... | ..... |
| | 63 | <i>a</i> | 22.2 22.3 22.3 | 22.27 | ..... | ..... | ..... | ..... |
| | 63 | <i>R</i> | 26.8 26.7 26.9 | 26.80 | ..... | ..... | ..... | ..... |
| 16 40 | 64 | <i>v</i> | 27.8 29.4 28.3 | 28.50 | ..... | ..... | ..... | ..... |



4315 R COMÆ.

R. A. 11h 59m 8s.4. Dec. +19° 20' 19", 1900.

TABLE 36.—4315 R COMÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 July 9. | | | 6-INCH. | | | | Good. | | |
|------------------|------------|-----------------------|-----------------|----------------------|------------|-------|-------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | ° | | | | | | | | |
| 15 54 | 57 | <i>A</i> | 13.7 14.4 14.1 | 14.07 | 14.90 | 0.92 | 7.79 | 8.09 | |
| | 57 | <i>Ba₁</i> | 13.2 13.1 13.1 | 13.13 | 14.02 | 0.80 | 7.67 | 7.97 | |
| | 56 | <i>Ra₁</i> | 33.3 33.5 34.0 | 33.60 | ..... | 3.14 | 10.01 | 10.31 | |
| | | <i>R</i> | 27.8 27.2 28.0 | 27.67 | 27.64 | 2.41 | 9.28 | 9.58 | |
| | 57— | <i>1U</i> | 35.1 35.0 34.9 | 35.00 | 34.27 | 3.18 | 10.05 | 10.35 | |
| | 57— | <i>F</i> | 14.1 13.5 13.3 | 13.63 | 13.72 | 0.75 | 7.62 | 7.92 | |
| | | <i>v</i> | 27.3 28.2 27.7 | 27.73 | ..... | 2.42 | 9.29 | 9.59 | |
| | 57 | <i>a</i> | 24.5 24.9 25.1 | 24.83 | 24.77 | 2.11 | 8.98 | 9.28 | |
| | 58— | <i>U</i> | 31.4 31.9 31.2 | 31.50 | 30.90 | 2.79 | 9.66 | 9.96 | |
| | 58 | <i>Da₁</i> | 14.0 14.3 14.0 | 14.10 | 14.27 | 0.83 | 7.70 | 8.00 | |
| | | <i>Da₁</i> | 14.0 14.5 14.8 | 14.43 | ..... | ..... | ..... | ..... |  |
| | 58 | <i>U</i> | 29.9 30.3 30.7 | 30.30 | ..... | ..... | ..... | ..... |  |
| | 58 | <i>a</i> | 24.3 24.8 25.0 | 24.70 | ..... | ..... | ..... | ..... |  |
| | 59 | <i>F</i> | 12.7 14.8 13.9 | 13.80 | ..... | ..... | ..... | ..... |  |
| | 60 | <i>1U</i> | 33.2 33.4 34.0 | 33.53 | ..... | ..... | ..... | ..... |  |
| | 60— | <i>R</i> | 26.8 28.2 27.8 | 27.60 | ..... | ..... | ..... | ..... |  |
| | 62— | <i>Ba₁</i> | 14.9 14.9 14.9 | 14.90 | ..... | ..... | ..... | ..... |  |
| | 62 | <i>A</i> | 15.6 15.7 16.0 | 15.73 | ..... | ..... | ..... | ..... |  |
| 1905 January 13. | | | 12-INCH. | | | | Good. | | |
| 12 24 | | <i>D</i> | 9.1 9.2 10.0 | 9.43 | 10.25 | 0.32 | 6.88 | 7.18 | |
| | | <i>U</i> | 31.3 32.1 31.7 | 31.70 | 32.74 | 3.02 | 9.58 | 9.88 | |
| | | <i>a</i> | 28.1 28.7 29.5 | 28.77 | 29.40 | 2.62 | 9.18 | 9.48 | |
| | | <i>1U</i> | 36.8 36.1 36.7 | 36.53 | 36.78 | 3.55 | 10.11 | 10.41 | |
| | | <i>F</i> | 15.7 16.1 15.6 | 15.80 | 16.26 | 1.12 | 7.68 | 7.98 | |
| | | <i>d</i> | 48.2 47.2 47.9 | 47.77 | 48.24 | 4.57 | 11.13 | 11.43 | |
| | | <i>R</i> | 30.3 30.3 30.3 | 30.30 | 29.78 | 2.66 | 9.22 | 9.52 | |
| | | <i>B</i> | 8.9 8.8 8.4 | 8.70 | 8.80 | 0.18 | 6.74 | 7.04 | |
| | | <i>A</i> | 17.5 18.1 18.1 | 17.90 | 17.86 | 1.33 | 7.89 | 8.19 | |
| | | <i>A</i> | 17.7 17.7 18.1 | 17.83 | ..... | ..... | ..... | ..... |  |
| | | <i>B</i> | 8.8 9.1 8.8 | 8.90 | ..... | ..... | ..... | ..... |  |
| | | <i>R</i> | 28.7 29.7 29.4 | 29.27 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 48.7 48.6 48.8 | 48.70 | ..... | ..... | ..... | ..... |  |
| | | <i>F</i> | 17.1 16.1 17.0 | 16.73 | ..... | ..... | ..... | ..... |  |
| | | <i>1U</i> | 36.3 37.7 37.1 | 37.03 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 29.2 30.3 30.6 | 30.03 | ..... | ..... | ..... | ..... |  |
| | | <i>U</i> | 33.8 34.3 33.2 | 33.77 | ..... | ..... | ..... | ..... |  |
| | | <i>D</i> | 10.5 11.5 11.2 | 11.07 | ..... | ..... | ..... | ..... |  |
| 1905 February 3. | | | 12-INCH. | | | | Good, —4°F. | | |
| 14 0 | 34 | <i>R</i> | 13.0 13.5 14.0 | 13.50 | 15.12 | 1.07 | 9.10 | 9.40 | |
| | | <i>1U</i> | 23.6 24.6 23.9 | 24.03 | 24.52 | 2.16 | 10.19 | 10.49 | |
| | | <i>c</i> | 46.5 46.5 46.3 | 46.43 | 45.28 | 4.36 | 12.39 | 12.69 | |
| | | <i>b</i> | 42.8 44.2 43.0 | 43.33 | 43.28 | 4.13 | 12.16 | 12.46 | |
| | | <i>d</i> | 31.0 31.9 31.3 | 31.40 | 29.72 | 2.62 | 10.65 | 10.95 | |
| | | <i>Fa₁</i> | 8.4 8.7 8.4 | 8.50 | 8.76 | 0.31 | 8.34 | 8.64 | |
| | | <i>f</i> | 26.7 27.0 26.9 | 26.87 | 27.72 | 2.43 | 10.46 | 10.76 | |
| | | <i>a</i> | 15.5 15.7 15.4 | 15.53 | 14.78 | 1.02 | 9.05 | 9.35 | |
| | | <i>U</i> | 21.8 21.7 20.8 | 21.43 | 20.62 | 1.77 | 9.80 | 10.10 | |
| | | <i>u</i> | 19.3 19.9 20.2 | 19.80 | ..... | ..... | ..... | ..... |  |
| | | <i>A</i> | 13.8 13.9 14.4 | 14.03 | ..... | ..... | ..... | ..... |  |
| | | <i>P</i> | 11.3 11.8 11.8 | 11.63 | 0.62 | ..... | 8.65 | 8.95 | |
| | | <i>f</i> | 27.7 29.4 28.6 | 28.57 | ..... | ..... | ..... | ..... |  |
| | | <i>Fa₁</i> | 8.9 9.9 8.3 | 9.03 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 27.8 28.2 28.9 | 28.03 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 43.1 43.9 42.3 | 43.23 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 44.0 44.6 43.8 | 44.13 | ..... | ..... | ..... | ..... |  |
| | | <i>1U</i> | 25.0 25.2 24.8 | 25.00 | ..... | ..... | ..... | ..... |  |
| | | <i>R</i> | 17.0 16.1 17.1 | 16.73 | ..... | ..... | ..... | ..... |  |
| 14 43 | | | 12-INCH. | | | | Good, —4°F. | | |
| 14 43 | 45 | <i>R</i> | 13.0 13.5 14.0 | 13.50 | 15.12 | 1.07 | 9.10 | 9.40 | |
| | | <i>1U</i> | 23.6 24.6 23.9 | 24.03 | 24.52 | 2.16 | 10.19 | 10.49 | |
| | | <i>c</i> | 46.5 46.5 46.3 | 46.43 | 45.28 | 4.36 | 12.39 | 12.69 | |
| | | <i>b</i> | 42.8 44.2 43.0 | 43.33 | 43.28 | 4.13 | 12.16 | 12.46 | |
| | | <i>d</i> | 31.0 31.9 31.3 | 31.40 | 29.72 | 2.62 | 10.65 | 10.95 | |
| | | <i>Fa₁</i> | 8.4 8.7 8.4 | 8.50 | 8.76 | 0.31 | 8.34 | 8.64 | |
| | | <i>f</i> | 26.7 27.0 26.9 | 26.87 | 27.72 | 2.43 | 10.46 | 10.76 | |
| | | <i>a</i> | 15.5 15.7 15.4 | 15.53 | 14.78 | 1.02 | 9.05 | 9.35 | |
| | | <i>U</i> | 21.8 21.7 20.8 | 21.43 | 20.62 | 1.77 | 9.80 | 10.10 | |
| | | <i>u</i> | 19.3 19.9 20.2 | 19.80 | ..... | ..... | ..... | ..... |  |
| | | <i>A</i> | 13.8 13.9 14.4 | 14.03 | ..... | ..... | ..... | ..... |  |
| | | <i>P</i> | 11.3 11.8 11.8 | 11.63 | 0.62 | ..... | 8.65 | 8.95 | |
| | | <i>f</i> | 27.7 29.4 28.6 | 28.57 | ..... | ..... | ..... | ..... |  |
| | | <i>Fa₁</i> | 8.9 9.9 8.3 | 9.03 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 27.8 28.2 28.9 | 28.03 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 43.1 43.9 42.3 | 43.23 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 44.0 44.6 43.8 | 44.13 | ..... | ..... | ..... | ..... |  |
| | | <i>1U</i> | 25.0 25.2 24.8 | 25.00 | ..... | ..... | ..... | ..... |  |
| | | <i>R</i> | 17.0 16.1 17.1 | 16.73 | ..... | ..... | ..... | ..... |  |

TABLE 36.—4315 R COMÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1905 February 27. | | | 12-INCH. | | Good, a little unsteady. | | | |
|--------------------|------------|------------|-----------------|----------------------|--------------------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 8 25 | ° | <i>R</i> | 18.3 19.0 19.1 | 18.80 | 18.62 | 1.55 | 9.29 | 9.59 |
| | | <i>iU</i> | 27.7 28.3 27.5 | 27.83 | 27.15 | 2.38 | 10.12 | 10.42 |
| | | <i>d</i> | 33.4 33.6 32.9 | 33.30 | 32.66 | 2.93 | 10.67 | 10.97 |
| | | <i>c</i> | 48.9 47.8 48.7 | 48.47 | 48.72 | 4.68 | 12.42 | 12.72 |
| | | <i>b</i> | 45.0 46.7 46.2 | 45.97 | 46.70 | 4.50 | 12.24 | 12.54 |
| | | <i>Fat</i> | 12.2 12.4 12.3 | 12.30 | 12.55 | 0.75 | 8.49 | 8.79 |
| | | <i>f</i> | 32.1 32.4 33.2 | 32.57 | 32.34 | 2.89 | 10.63 | 10.93 |
| | | <i>a</i> | 15.6 16.9 16.0 | 16.17 | 16.54 | 1.26 | 9.00 | 9.30 |
| | | <i>U</i> | 22.0 22.8 23.0 | 22.60 | 22.75 | 2.00 | 9.74 | 10.04 |
| | | <i>U</i> | 23.0 22.6 23.1 | 22.90 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 16.7 16.9 17.0 | 16.87 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 31.0 33.2 32.1 | 32.10 | ..... | ..... | ..... | ..... |
| | | <i>Fat</i> | 12.8 13.3 12.3 | 12.80 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 47.8 47.6 46.9 | 47.43 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 49.0 48.8 49.1 | 48.97 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 32.0 32.0 32.1 | 32.03 | ..... | ..... | ..... | ..... |
| | | <i>iU</i> | 26.0 27.1 26.3 | 26.47 | ..... | ..... | ..... | ..... |
| 8 50 | | <i>R</i> | 18.5 18.7 18.1 | 18.43 | ..... | ..... | ..... | ..... |
| 1905 March 3. | | | Good. | | | | | |
| 9 45 | | <i>R</i> | 13.7 13.4 13.4 | 13.50 | 15.26 | 1.09 | 9.07 | 9.37 |
| | | <i>iU</i> | 23.3 23.0 22.8 | 23.03 | 24.33 | 2.14 | 10.12 | 10.43 |
| | | <i>c</i> | 46.9 46.1 45.8 | 46.27 | 46.74 | 4.50 | 12.48 | 12.78 |
| | | <i>b</i> | 45.5 45.0 45.6 | 45.37 | 46.58 | 4.49 | 12.47 | 12.77 |
| | | <i>d</i> | 29.4 30.0 29.8 | 29.73 | 30.52 | 2.71 | 10.69 | 10.99 |
| | | <i>Fat</i> | 9.7 8.9 8.9 | 9.17 | 9.44 | 0.37 | 8.35 | 8.65 |
| | | <i>f</i> | 29.5 28.8 29.2 | 29.17 | 29.90 | 2.65 | 10.63 | 10.93 |
| | | <i>a</i> | 15.9 16.3 15.9 | 16.03 | 16.25 | 1.23 | 9.21 | 9.51 |
| | | <i>U</i> | 20.0 21.1 20.1 | 20.73 | 20.76 | 1.79 | 9.77 | 10.07 |
| | | <i>U</i> | 20.5 21.2 20.7 | 20.80 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 16.0 16.8 16.6 | 16.47 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 31.0 29.9 31.0 | 30.63 | ..... | ..... | ..... | ..... |
| | | <i>Fat</i> | 10.1 8.9 10.1 | 9.70 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 31.0 31.8 31.1 | 31.30 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 47.7 48.4 47.3 | 47.80 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 47.2 46.7 47.7 | 47.20 | ..... | ..... | ..... | ..... |
| | | <i>iU</i> | 25.0 26.2 25.7 | 25.63 | ..... | ..... | ..... | ..... |
| 10 24 | 41 | <i>R</i> | 16.9 17.3 16.9 | 17.03 | ..... | ..... | ..... | ..... |
| 1905 March 5. | | | 40-INCH. | | Quite good. | | | |
| 15 0 | | <i>c</i> | 26.5 27.7 25.8 | 26.67 | 26.64 | 2.35 | 12.05 | 12.35 |
| | | <i>b</i> | 25.7 26.4 26.3 | 26.13 | 27.22 | 2.38 | 12.08 | 12.38 |
| | | <i>d</i> | 16.3 17.2 16.1 | 16.53 | 16.46 | 1.25 | 10.95 | 11.25 |
| | | <i>δ</i> | 52.8 54.3 53.0 | 53.37 | 52.50 | 5.03 | 14.73 | 15.03 |
| | | <i>a</i> | 48.5 47.7 48.6 | 48.27 | 46.95 | 4.47 | 14.17 | 14.47 |
| | | <i>z</i> | 34.8 34.2 34.0 | 34.33 | 33.72 | 3.05 | 12.75 | 13.05 |
| | | <i>β</i> | 42.1 43.3 43.2 | 42.87 | 44.00 | 4.22 | 13.92 | 14.22 |
| | | <i>ε</i> | 36.7 36.3 37.2 | 36.73 | 37.85 | 3.53 | 13.23 | 13.53 |
| | | <i>γ</i> | 48.3 49.0 47.8 | 48.37 | 46.47 | 4.46 | 14.16 | 14.46 |
| | | <i>v</i> | 44.0 44.0 44.6 | 44.20 | 43.78 | 4.18 | 13.88 | 14.18 |
| | | <i>f</i> | 15.8 16.2 16.5 | 16.17 | 16.00 | 1.19 | 10.89 | 11.19 |
| | | <i>f</i> | 15.0 16.2 16.3 | 15.83 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 43.1 43.0 44.0 | 43.37 | ..... | ..... | ..... | ..... |
| | | <i>γ</i> | 46.2 44.8 45.7 | 45.57 | ..... | ..... | ..... | ..... |
| | | <i>ε</i> | 37.2 38.6 38.1 | 37.97 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 44.1 45.2 46.1 | 45.13 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 32.2 33.8 33.3 | 33.10 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 45.1 46.0 45.8 | 45.63 | ..... | ..... | ..... | ..... |
| | | <i>δ</i> | 52.0 51.7 51.3 | 51.63 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 15.5 16.9 16.8 | 16.40 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 28.1 28.1 28.7 | 28.30 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 26.5 26.7 26.6 | 26.60 | ..... | ..... | ..... | ..... |
| 15 30 | | <i>u</i> | 33.9 34.7 34.0 | 34.20 | 3.11 | ..... | 12.81 | 13.11 |

TABLE 36.—4315 R COMÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1905 April 1. | | 40-INCH | | Fair to good, settings good. | | | | |
|--------------------|------------|----------|-----------------|------------------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 8 56 | ° | <i>c</i> | 26.4 27.2 26.3 | 26.63 | 24.98 | 2.20 | 12.26 | 12.56 |
| | | <i>b</i> | 23.8 24.1 24.7 | 24.20 | 22.75 | 2.00 | 12.06 | 12.36 |
| | | <i>u</i> | 31.2 32.3 31.4 | 31.63 | 31.03 | 2.76 | 12.82 | 13.12 |
| | | <i>d</i> | 14.1 12.4 13.2 | 13.23 | 13.85 | 0.89 | 10.95 | 11.25 |
| | | <i>δ</i> | 49.0 51.2 51.3 | 50.50 | 48.04 | 4.62 | 14.68 | 14.98 |
| | | <i>α</i> | 42.3 43.8 43.3 | 43.13 | 41.20 | 3.91 | 13.97 | 14.27 |
| | | <i>z</i> | 34.5 33.0 33.2 | 33.57 | 33.08 | 2.98 | 13.04 | 13.34 |
| | | <i>v</i> | 38.8 41.1 40.0 | 39.97 | 39.28 | 3.70 | 13.76 | 14.06 |
| | | <i>γ</i> | 45.7 44.1 44.6 | 44.80 | 45.44 | 4.37 | 14.43 | 14.73 |
| | | <i>ε</i> | 36.3 36.4 36.9 | 36.53 | 36.03 | 3.32 | 13.38 | 13.68 |
| | | <i>β</i> | 45.5 46.4 45.7 | 45.87 | 45.25 | 4.36 | 14.42 | 14.72 |
| | | <i>f</i> | 10.0 12.6 11.7 | 11.43 | 11.65 | 0.62 | 10.68 | 10.98 |
| | | <i>f</i> | 11.4 11.1 13.1 | 11.87 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 44.0 45.1 44.8 | 44.63 | ..... | ..... | ..... | ..... |
| | | <i>ε</i> | 35.0 35.9 35.7 | 35.53 | ..... | ..... | ..... | ..... |
| | | <i>γ</i> | 45.2 47.0 46.0 | 46.07 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 39.2 37.8 38.8 | 38.60 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 32.0 32.4 33.4 | 32.60 | ..... | ..... | ..... | ..... |
| | | <i>α</i> | 40.8 38.1 38.9 | 39.27 | ..... | ..... | ..... | ..... |
| | | <i>δ</i> | 43.9 48.3 44.5 | 45.57 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 14.2 15.0 14.2 | 14.47 | ..... | ..... | ..... | ..... |
| | | <i>u</i> | 29.3 31.0 31.0 | 30.43 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 18.8 23.0 22.1 | 21.30 | ..... | ..... | ..... | ..... |
| 9 27 | | <i>c</i> | 23.7 22.9 23.1 | 23.23 | ..... | ..... | ..... | ..... |

| 1905 April 4. | | Good. | | | | | | |
|---------------|--|----------|----------------|----------|----------------|-------|-------|-------|
| 14 26 | | <i>c</i> | 32.2 31.5 31.9 | 31.87 | 31.52 | 2.81 | 12.28 | 12.58 |
| | | <i>b</i> | 31.9 32.1 31.9 | 31.97 | 31.07 | 2.76 | 12.23 | 12.53 |
| | | <i>u</i> | 38.1 37.7 36.7 | 37.50 | 36.28 | 3.34 | 12.81 | 13.11 |
| | | <i>d</i> | 16.2 17.3 16.8 | 16.73 | 17.20 | 1.35 | 10.82 | 11.12 |
| | | <i>δ</i> | 54.0 53.7 54.3 | 54.00 | 54.86 | 5.21 | 14.68 | 14.98 |
| | | <i>α</i> | 47.5 48.9 48.3 | 48.23 | 48.03 | 4.62 | 14.09 | 14.39 |
| | | <i>z</i> | 35.7 36.1 35.3 | 35.70 | 35.34 | 3.22 | 12.69 | 12.99 |
| | | <i>v</i> | 40.7 40.4 40.9 | 40.67 | 41.62 | 3.95 | 13.42 | 13.72 |
| | | <i>γ</i> | 46.1 47.3 45.8 | 46.40 | 46.24 | 4.45 | 13.92 | 14.22 |
| | | <i>ε</i> | 37.3 38.6 38.7 | 38.20 | 37.68 | 3.50 | 12.97 | 13.27 |
| | | <i>β</i> | 47.0 47.8 44.4 | 46.33 | 45.96 | 4.42 | 13.89 | 14.19 |
| | | <i>f</i> | 16.0 15.2 15.9 | 15.70 | 15.78 | 1.16 | 10.63 | 10.93 |
| | | <i>f</i> | 15.8 16.1 15.7 | 15.87 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 45.1 44.8 46.9 | 45.60 | ..... | ..... | ..... | ..... |
| | | <i>ε</i> | 37.0 37.8 36.7 | 37.17 | ..... | ..... | ..... | ..... |
| | | <i>γ</i> | 44.6 47.5 46.3 | 46.07 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 42.9 42.7 42.1 | 42.57 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 35.0 34.9 35.0 | 34.97 | ..... | ..... | ..... | ..... |
| | | <i>α</i> | 47.7 47.4 48.4 | 47.83 | ..... | ..... | ..... | ..... |
| | | <i>δ</i> | 55.2 57.0 55.0 | 55.73 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 18.2 17.3 17.5 | 17.67 | ..... | ..... | ..... | ..... |
| | | <i>u</i> | 34.0 35.0 36.2 | 35.07 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 30.0 30.7 29.8 | 30.17 | ..... | ..... | ..... | ..... |
| | | 15 02 | 45 | <i>c</i> | 30.7 31.7 31.1 | 31.17 | | |

TABLE 37.—4315 R COMÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|---------------------|--------------|-----------|------|---------------|-----------|--------------|-----------|------|---------------|-----------|------------------|-----------|------|---------------|-----------|
| Star. | 1904 July 4. | | | | | 1904 July 9. | | | | | 1905 January 12. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| A.... | 0.83 | 7.98 | 8.28 | + .22 | + .12 | 0.92 | 7.79 | 8.09 | + .03 | -.07 | 1.33 | 7.89 | 8.19 | + .13 | + .03 |
| B.... | -0.37 | 6.78 | 7.08 | -.13 | + .04 | 0.05 | 6.92 | 7.22 | + .01 | + .18 | 0.18 | 6.74 | 7.04 | -.17 | .00 |
| F.... | 0.42 | 7.57 | 7.87 | -.07 | -.15 | 0.75 | 7.62 | 7.92 | -.02 | -.10 | 1.12 | 7.68 | 7.98 | + .04 | -.04 |
| Means.. | 0.29 | 7.44 | 7.74 | \pm .14 | \pm .10 | 0.57 | 7.44 | 7.74 | \pm .02 | \pm .12 | 0.88 | 7.44 | 7.74 | \pm .11 | \pm .02 |
| M ₀.... | .... | 7.15 | 7.45 | ..... | ..... | .... | 6.87 | 7.17 | ..... | ..... | .... | 6.56 | 6.86 | ..... | ..... |

| 12-INCH. | | | | | 40-INCH. | | | | |
|----------------------|-----------------|---------|----------|---------|----------------------|------------------|---------|---------|---------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | |
| | | Feb. 3. | Feb. 27. | Mar. 3. | | | Mar. 5. | Apr. 1. | Apr. 4. |
| a..... | 9.11 | 1.02 | 1.26 | 1.23 | b..... | 12.29 | 2.38 | 2.00 | 2.76 |
| R..... | 9.35 | 1.07 | 1.55 | 1.09 | c..... | 12.43 | 2.35 | 2.20 | 2.81 |
| U..... | 9.58 | 1.77 | 2.00 | 1.79 | d..... | 10.67 | 1.25 | 0.89 | 1.35 |
| rU..... | 10.10 | 2.16 | 2.38 | 2.14 | f..... | 10.57 | 1.19 | 0.62 | 1.16 |
| Mean C... | ..... | 1.51 | 1.80 | 1.56 | Mean C.... | ..... | 1.79 | 1.43 | 2.02 |
| Mean Mag. | 9.54 | 9.54 | 9.54 | 9.54 | Mean Mag.. | 11.49 | 11.49 | 11.49 | 11.49 |
| M ₀..... | ..... | 8.03 | 7.74 | 7.98 | M ₀..... | ..... | 9.70 | 10.06 | 9.47 |

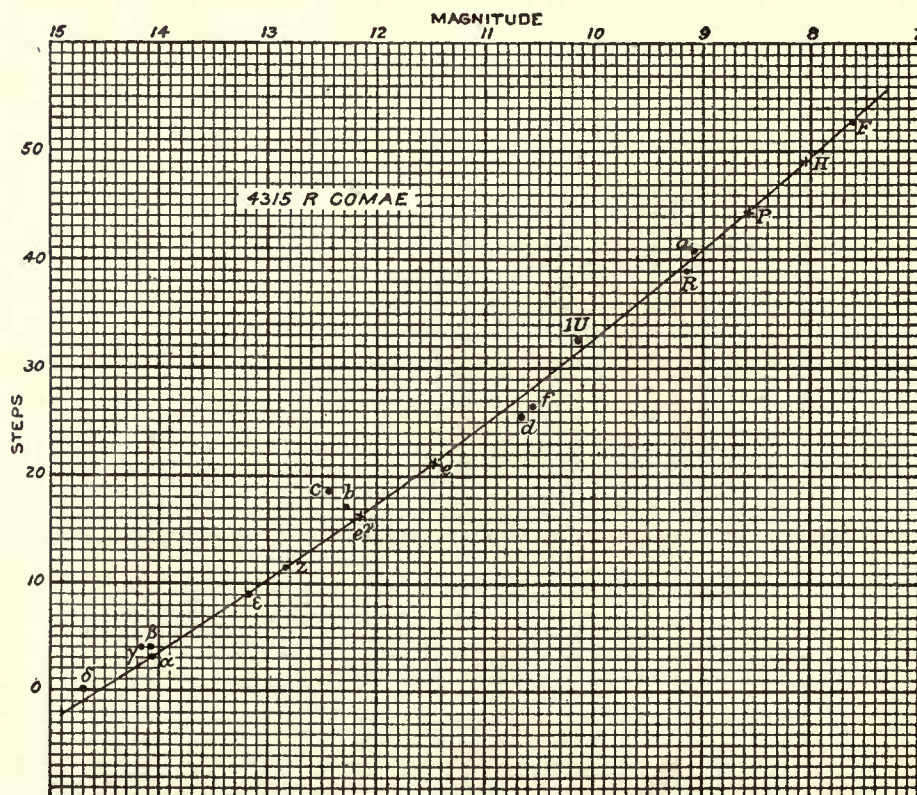


FIG. 13.—MAGNITUDE-CURVE FOR R COMÆ.

TABLE 38.—4315 R COMÆ. MEAN MAGNITUDES.

| 6-INCH. | | | | | | | | | |
|------------------------------------|-------------|---------------|--------------|---------------|-------------|---------------|---------|---------|---------------|
| Star. | July 4. | | July 9. | | January 12. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>A</i> | 7.98 | +0.09 | 7.79 | -0.10 | 7.89 | 0.00 | 7.89 | 8.19 | ± 0.06 |
| <i>B</i> | 6.78 | -0.03 | 6.92 | +0.11 | 6.74 | -0.07 | 6.81 | 7.11 | ± 0.07 |
| <i>F</i> | 7.57 | -0.05 | 7.62 | 0.00 | 7.68 | +0.06 | 7.62 | 7.92 | ± 0.04 |
| Mean | | | | | | | 7.44 | 7.74 | ± 0.06 |
| <i>a</i> | 9.16 | +0.05 | 8.98 | -0.13 | 9.18 | +0.07 | 9.11 | 9.41 | ± 0.08 |
| <i>R</i> | 9.56 | +0.21 | 9.28 | -0.07 | 9.22 | -0.13 | 9.35 | 9.65 | ± 0.14 |
| <i>U</i> | 9.51 | -0.07 | 9.66 | +0.08 | 9.58 | 0.00 | 9.58 | 9.88 | ± 0.05 |
| <i>1U</i> | 10.15 | +0.05 | 10.05 | -0.05 | 10.11 | +0.01 | 10.10 | 10.40 | ± 0.04 |
| Mean | | | | | | | 9.54 | 9.84 | ± 0.08 |
| 12-INCH. | | | | | | | | | |
| Star. | February 3. | | February 27. | | March 3. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>a</i> | 9.05 | -0.04 | 9.00 | -0.09 | 9.21 | +0.12 | 9.09 | 9.39 | ± 0.08 |
| <i>R</i> | 9.10 | -0.05 | 9.29 | +0.14 | 9.07 | -0.08 | 9.15 | 9.45 | ± 0.09 |
| <i>U</i> | 9.80 | +0.03 | 9.74 | -0.03 | 9.77 | 0.00 | 9.77 | 10.07 | ± 0.02 |
| <i>1U</i> | 10.19 | +0.05 | 10.12 | -0.02 | 10.12 | -0.02 | 10.14 | 10.44 | ± 0.03 |
| Mean | | | | | | | 9.54 | 9.84 | ± 0.06 |
| <i>b</i> | 12.16 | -0.13 | 12.24 | -0.05 | 12.47 | +0.18 | 12.29 | 12.59 | ± 0.12 |
| <i>c</i> | 12.39 | -0.04 | 12.42 | -0.01 | 12.48 | +0.05 | 12.43 | 12.73 | ± 0.03 |
| <i>d</i> | 10.65 | -0.02 | 10.67 | 0.00 | 10.69 | +0.02 | 10.67 | 10.97 | ± 0.01 |
| <i>f</i> | 10.46 | -0.11 | 10.63 | +0.06 | 10.63 | +0.06 | 10.57 | 10.87 | ± 0.08 |
| Mean | | | | | | | 11.49 | 11.79 | ± 0.06 |
| 40-INCH. | | | | | | | | | |
| Star. | March 5. | | April 1. | | April 6. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>b</i> | 12.08 | -0.04 | 12.06 | -0.06 | 12.23 | +0.11 | 12.12 | 12.42 | ± 0.07 |
| <i>c</i> | 12.05 | -0.15 | 12.26 | +0.06 | 12.28 | +0.08 | 12.20 | 12.50 | ± 0.10 |
| <i>d</i> | 10.95 | +0.04 | 10.95 | +0.04 | 10.82 | -0.09 | 10.91 | 11.21 | ± 0.06 |
| <i>f</i> | 10.89 | +0.16 | 10.68 | -0.05 | 10.63 | -0.10 | 10.73 | 11.03 | ± 0.10 |
| Mean | | | | | | | 11.49 | 11.79 | ± 0.08 |
| <i>u</i> | 12.81 | 0.00 | 12.82 | +0.01 | 12.81 | 0.00 | 12.81 | 13.11 | 0.00 |
| <i>z</i> | 12.75 | -0.08 | 13.04 | +0.21 | 12.69 | -0.14 | 12.83 | 13.13 | ± 0.14 |
| <i>a</i> | 14.17 | +0.09 | 13.97 | -0.11 | 14.09 | +0.01 | 14.08 | 14.38 | ± 0.07 |
| <i>β</i> | 13.92 | -0.16 | 14.42 | +0.34 | 13.89 | -0.19 | (14.08 | 14.38 | ± 0.23) |
| <i>γ</i> | 14.16 | -0.01 | 14.43 | +0.26 | 13.92 | -0.25 | (14.17 | 14.47 | ± 0.17) |
| <i>δ</i> | 14.73 | -0.03 | 14.68 | -0.02 | 14.68 | -0.02 | 14.70 | 15.00 | ± 0.02 |
| <i>ϵ</i> | 13.23 | +0.04 | 13.38 | +0.19 | 12.97 | -0.22 | 13.19 | 13.49 | ± 0.15 |

TABLE 39.—4315 R COME. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. | |
|------|----------------|--------------|---------------------|----------|-----------|--------------|--|------------------------|----------|---------|------|--------|--------|
| | Month and Day. | Hour C. S.T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | | |
| 1894 | | | | | | | | | | | | | |
| 1 | Mar. | 9 | .. | 2410000+ | 150? | 6 | v not seen, limit $< 12^M$ ..... | .... | < 12 | poor | ... | .... |  |
| 2 | | 26 | 9 | 2897 | 150? | 6 | v not seen, limit $< 12^M$ ..... | .... | < 12 | good | ... | .... |  |
| 3 | Apr. | 7 | 8 | 2914.60 | 150? | 6 | v not seen, limit $< 12^M$ ..... | .... | < 12 | good | ... | .... |  |
| 4 | | 22 | 9 | 2926.61 | ... | 6 | v not seen, limit $< 12^M$ ..... | .... | < 12 | fine | ... | .... |  |
| 5 | May | 4 | 9 | 2941.64 | 150 | 6 | v not seen, limit b ..... | .... | < 12.3 | fair | ... | .... |  |
| 6 | | 10 | 9 | 2953.63 | ... | 6 | v not seen ..... | .... | .... | poor | ... | .... |  |
| 7 | | 11 | 9 | 2959.63 | 150 | 6 | v not seen, limit $1 < b$ ..... | .... | < 12.4 | good | ... | .... |  |
| 8 | | 31 | 10 | 2960.63 | 40 | 6 | v not seen, limit b ..... | .... | < 12.3 | good | ... | .... |  |
| 9 | June | 6 | 10 | 2980.67 | 150 | 6 | v glimpsed, $b1-2v$ | 15.6 | 12.26 | good | 0 | -0.74 | |
| 10 | | 18 | 9 | 2986.65 | ... | 6 | v not seen, limit $1-2 < e$ | < 19 | < 11.8 | fair | ... | .... |  |
| 11 | | 20 | 9 | 2998.63 | 150 | 6 | vc , $v1-2b$ | 18.6, 18.6 | 18.6 | 11.85 | fair | 14 | -0.70 |
| 12 | | 24 | 10 | 3000.63 | 150 | 6 | $v1-2c$, $v1-2b$, $e3v$ | 20.1, 18.6, 18.3 | 19.0 | 11.80 | fair | 18 | -0.60 |
| 13 | | 30 | 10 | 3004.67 | 40 | 6 | $v2c$, $e1-2v$ | 20.6, 19.8 | 20.2 | 11.61 | good | 24 | -0.43 |
| 14 | July | 6 | 10 | 3010.67 | 150 | 6 | $v2-3c$, $e2v$ | 21.1, 19.3 | 20.2 | 11.61 | moon | 30 | -0.21 |
| 15 | | 23 | 9 | 3016.65 | 40 | 6 | $x1-2v$, $v4f$, $f4e$ | 30.4, 30.4 | 30.4 | 10.27 | fair | 47 | -0.72 |
| 1896 | | | | | | | | | | | | | |
| 16 | May | 28 | 9 | 3708.63 | ... | 6 | v not seen, limit $4 < e$ | < 17 | < 12.0 | good | 2 | .... |  |
| 17 | June | 6 | 9 | 3717.63 | 150 | 6 | v glimpsed, $e3v$? | 8.3 | 11.88 | fair | 11 | -0.73 | |
| 18 | | 10 | 9 | 3721.63 | ... | 6 | v not seen ..... | .... | .... | fine | 15 | .... |  |
| 19 | | 30 | 9 | 3741.63 | 150 | 6 | v not seen, limit $3 < e$ | < 18 | < 11.9 | fair | 35 | .... |  |
| 20 | July | 6 | 10 | 3747.67 | 150 | 6 | $e4v$, limit $1 < v$ | 17.3 | 12.01 | good | 41 | +0.80 | |
| 21 | | 11 | 9 | 3752.63 | 150 | 6 | $ve \pm$ | 21.3 | 11.48 | poor | 46 | +0.48 | |
| 22 | | 24 | 9 | 3765.63 | ... | 6 | $R1-2v$ | 37.5 | 9.38 | moon | 59 | -0.73 | |
| 23 | Aug. | 3 | 9 | 3775.63 | 40 | 6 | $R1v$, $v1-2$ $1U$ | 36.0 | 9.58 | fair | 69 | +0.15 | |
| 24 | | 8 | 9 | 3780.63 | 80 | 6 | $Rv \pm$, $v1$ $1U$ | 39.0, 33.6 | 36.3 | 9.53 | .... | 74 | +0.35 |
| 25 | | 10 | 8 | 3782.58 | 40 | 6 | $v0-1R$, $v2-3$ $1U$, $a3v$, $p5v$.. | 39.0, 35.1, 37.9, 39.2 | 37.8 | 9.35 | fair | 76 | +0.25 |
| 26 | | 17 | 8 | 3789.58 | ... | 6 | $v0-1R$, $P3-4v$, $a1-2v$ | 39.5, 40.7, 39.4 | 39.8 | 9.10 | fair | 83 | +0.20 |
| 27 | | 26 | 8 | 3798.57 | 40 | 6 | vR , $P3-4v$, $v1a$ | 39.0, 40.7, 41.4 | 40.4 | 9.03 | fair | 92 | +0.22 |
| 28 | Nov. | 12 | 17 | 3876.96 | ... | 6 | $v1$, $v1d$, $v8e$ | 26.4, 26.4, 29.3 | 26.4 | 10.79 | good | 170 | +0.24 |
| 29 | Dec. | 2 | 18 | 3897.00 | 150 | 6 | $d4v$, $v1-2e$ | 21.4, 22.8 | 21.6 | 11.42 | good | 191 | +0.02 |
| | | | | | 40 | 6 | $d6v$ | 19.4 | | | | | |
| 1897 | | | | | | | | | | | | | |
| 30 | Jan. | 7 | 18 | 3933.00 | 150 | 6 | $e6-8v$, $e23v$ | 14.3, 13.3 | 13.8 | 12.50 | good | 227 | +0.28 |
| 31 | July | 2 | 9 | 4108.63 | 40 | 6 | ve , $d3v$ | 21.3, 22.4 | 21.8 | 11.40 | good | 42 | +0.20 |
| 32 | | 8 | 9 | 4114.63 | 40 | 6 | $v2d$, $v3f$, $1U5v$ | 27.4, 29.4, 27.6 | 28.1 | 10.58 | good | 48 | -0.34 |
| 33 | | 16 | 9 | 4122.63 | 40 | 6 | $R5v$, $v3-4$ $1U$, $R3-4v$ | 34.0, 36.1, 35.5 | 35.2 | 9.68 | good | 56 | -0.60 |
| 34 | | 21 | 9 | 4127.63 | 40 | 6 | $R1-2v$, $v3-4$ $1U$ | 37.5, 38.1 | 37.8 | 9.36 | good | 61 | -0.42 |
| 35 | | 27 | 10 | 4133.67 | 40 | 6 | $v1R$, $a2v$ | 40.0, 38.9 | 39.4 | 9.12 | good | 67 | -0.36 |
| 36 | Aug. | 1 | 9 | 4138.61 | 40 | 6 | $v6R$, $P0-1v$, $v2-3a$ | 45.0, 43.7, 43.4 | 43.8 | 8.61 | good | 72 | -0.58 |
| 37 | | 6 | 8 | 4143.58 | 40 | 6 | $v2P$ ..... | ..... | 46.2 | 8.33 | good | 77 | -0.34 |
| 38 | | 11 | 8 | 4148.58 | 40 | 6 | $F6v$, $v2P$, $H3-4v$ | 46.9, 46.2, 45.7 | 46.3 | 8.32 | good | 82 | -0.60 |
| 39 | | 13 | 8 | 4150.58 | 40 | 6 | $F5v$, $v1P$, $H3-4v$ | 47.9, 45.2, 45.7 | 45.9 | 8.37 | poor | 84 | -0.51 |
| 40 | | 19 | 8 | 4156.58 | 40 | 6 | $F5v$, $v1P$, $H3v$ | 47.9, 45.2, 46.2 | 46.4 | 8.31 | fair | 90 | -0.50 |
| 41 | | 20 | 8 | 4157.58 | 40 | 6 | $F5v$, $v1P$, $H4v$ | 47.9, 45.2, 45.2 | 45.8 | 8.38 | good | 91 | -0.42 |
| 42 | | 24 | 8 | 4161.57 | 40 | 6 | $F5-6v$, $v2-3P$, $H4v$ | 47.4, 46.7, 45.2 | 46.4 | 8.31 | fair | 95 | -0.49 |
| 43 | | 27 | 8 | 4164.57 | 40 | 6 | $F5v$, $v2P$, $H3-4v$ | 47.9, 46.2, 45.7 | 46.6 | 8.30 | fair | 98 | -0.50 |
| 44 | | 29 | 8 | 4166.57 | 40 | 6 | $F5v$, $v2P$, $H3v$ | 47.9, 46.2, 46.2 | 46.8 | 8.28 | good | 100 | -0.51 |
| 45 | Sept. | 27 | 17 | 4195.96 | ... | 6 | f limit, v not seen | < 53 | < 7.5 | poor | ... | .... |  |
| 46 | | 30 | 17 | 4198.96 | 150 | 6 | $P4-5v$, $vR \pm$ | 39.7, 39.0 | 39.3 | 9.15 | poor | 132 | +0.03 |
| 47 | Oct. | 8 | 17 | 4206.96 | 40 | 6 | $R3v$, $v3$ $1U$ | 36.0, 35.6 | 35.8 | 9.60 | good | 140 | +0.30 |
| 48 | | 25 | 17 | 4223.96 | 40 | 6 | $1U4v$, $v1f$, $v2d$ | 28.6, 27.4, 27.4 | 27.9 | 10.60 | good | 157 | +0.58 |
| 1898 | | | | | | | | | | | | | |
| 49 | June | 14 | 10 | 4455.67 | ... | 12 | $c4-5v$, $v2z$ | 14.1, 13.3 | 13.7 | 12.52 | fair | 29 | +0.57 |
| 50 | July | 5 | 10 | 4476.67 | ... | 12 | $v1-2e$, $d3v$ | 22.8, 22.4 | 22.6 | 11.30 | fair | 50 | +0.60 |
| 51 | | 20 | 9 | 4491.63 | ... | 12 | $v5$ $1U$, $a6v$ | 37.6, 34.9 | 36.2 | 9.55 | .... | 65 | -0.03 |
| 52 | Aug. | 1 | 9 | 4503.61 | ... | 12 | $F8v$, $v8P$ | 44.9, 52.2 | 48.6 | 8.06 | poor | 77 | -1.02± |
| 53 | | 9 | .. | 4513.6 | ... | 12 | $F10v$, $v5P$ | 42.9, 49.2 | 46.0 | 8.35 | fair | 87 | -0.45 |

TABLE 39.—4315 R COMÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|------|----------------|---------------|---------------------|---------|-----------|--------------------------------------|------------------------|--------|-------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1898 | | | | | | | | | | | | |
| 54 | Aug. 19 | 9 | 2410000+ | 80 | 12 | P2v, v10-12 1U, v6-7R .. | 42.2, 43.6, 46.5 .. | 43.3 | 8.67 | fair | 95 | -0.23 |
| 55 | 27 | 8 | 4521.60 | 80 | 6 | F12v, P4-5v..... | 40.9, 38.7 | 39.4 | 9.13 | good | 103 | +0.33 |
| 56 | Sept. 2 | 8 | 4535.57 | 40 | 6 | P3-4v, a1v | 40.7, 39.9 | 40.3 | 9.04 | fair | 109 | +0.24 |
| 57 | Nov. 14 | 17 | 4608.96 | 150 | 6 | d3v, v1-2e | 22.4, 22.8 | 22.6 | 11.30 | good | 182 | +0.22 |
| 58 | Dec. 23 | 18 | 4648.00 | 150 | 6 | v1-2z, e4v, b3v, c3v | 12.8, 17.3, 14.1, 15.6 | 14.9 | 12.38 | fine | 222 | +0.24 |
| 1899 | | | | | | | | | | | | |
| 59 | Dec. 14 | 18 | 5004.00 | ... | 6 | e3v, v2e2 | 18.3, 18.3 | 18.3 | 11.88 | .... | 218 | -0.17 |
| 1900 | | | | | | | | | | | | |
| 60 | Jan. 20 | 13 | 5040.79 | 350 | 40 | v3z | ... | 14.3 | 12.42 | fair | 254 | -0.21 |
| 61 | Feb. 1 | 18 | 5053.00 | 150 | 6 | v not seen, limit 2<b | ... | <15 | <12.3 | good | ... | .... |
| 62 | 9 | 16 | 5060.92 | 175 | 12 | z2-3v ? not sure | ... | 8.8 | 13.12 | .... | 274 | -0.01 |
| 63 | 18 | 13 | 5069.79 | 350 | 40 | z5v, v2-3a | 6.3, 5.5 | 5.9 | 13.68 | fair | 283 | +0.36 |
| 64 | 24 | 11 | 5073.71 | 350 | 40 | {z3-4v, v2-3a | 7.8, 5.5 | 6.6 | 13.56 | fair | 287 | -0.18 |
| | | | | | | {β1a, α3β, γ1a ..... | ... | ... | ... | ... | ... | .... |
| 65 | Mar. 2 | 11 | 5081 | 275 | 12 | v not seen, limit 3<z | ... | <8 | <13.3 | fair | ... | .... |
| 66 | 21 | 11 | 5100.71 | 275 | 12 | v not seen, limit 4-5<z | ... | <6.3 | <13.6 | fair | ... | .... |
| 67 | 22 | 11 | 5101.68 | 350 | 40 | z6a, v1a, z/e | ... | 4.0 | 13.95 | good | 315 | +0.25 |
| 68 | Apr. 4 | 13 | 5114.79 | 275 | 12 | {α, β, γ δ and ε seen, limit γ | 4.0, 3.0 | 3.5 | 14.05 | good | 328 | +0.35 |
| | | | | | | {v quite certainly glimpsed ..... | ... | ... | ... | ... | ... | .... |
| 69 | 6 | 14 | 5116.81 | 350 | 40 | e3v, v4y, z1-2e, ε4-5y | 6.0, 8.0 | 7.0 | 13.50 | fair | 330 | -0.30 |
| 70 | 18 | 9 | 5128.63 | 350 | 40 | v3y, v1-2e, z8v± | 7.0, 10.5 | 8.8 | 13.22 | fair | 342 | -0.28 |
| 71 | 18 | 10 | 5128.65 | 275 | 12 | v not held, ε seen. | ... | <9.0 | <13. | poor | ... | .... |
| 72 | 27 | ... | 5137.7 | 237 | 40 | z2v, vε, v4y | 9.3, 9.0, 8.0 | 8.8 | 13.2 | good | ... | .... |
| 73 | May 8 | ... | 5148.7 | 350 | 40 | z2-3v, v1e | 8.8, 10.0 | 9.4 | 13.17 | fair | 2 | +0.17 |
| +73 | 9 | ... | 5149.7 | 237 | 40 | photometer | ... | ... | 13.24 | poor | 3 | +0.26 |
| 74 | 24 | ... | 5164.7 | 275 | 12 | e28-10v, v1-2z, limit 2<z | ... | 12.8 | 12.65 | good | 18 | +0.36 |
| 75 | 25 | ... | 5165.7 | 80 | 12 | v2z | ... | 13.3 | 12.56 | good | 19 | +0.31 |
| 76 | 28 | ... | 5168.7 | 275 | 12 | b4v, v3z | 13.1, 14.3 | 13.7 | 12.52 | good | 22 | +0.41 |
| 77 | 29 | ... | 5169.7 | 237 | 40 | e28v, v3z | (8.3), 14.3 | 14.3 | 12.44 | good | 23 | +0.34 |
| 78 | 30 | 8 | 5170.58 | 237 | 40 | v2z, e28v, v3z | 13.3, 14.3 | 13.8 | 12.51 | good | 24 | +0.41 |
| 79 | June 8 | 11 | 5179.69 | 237 | 40 | photometer | ... | ... | 11.58 | low | 33 | -0.10 |
| 80 | 15 | 9 | 5186.63 | 150 | 6 | d3v, v4b | 22.4, 21.1 | 21.8 | 11.40 | fair | 40 | 0.00 |
| 81 | 23 | 10 | 5194.67 | 40 | 6 | d2v, v2e, f3v, v6-8b | 23.4, 23.4, 23.4(24.1) | 23.4 | 11.19 | good | 48 | +0.21 |
| 82 | 26 | 9 | 5196.63 | 150 | 6 | d2v, v6-8e | 23.4, 28.3 | 24.0 | 11.10 | fair | 50 | +0.40 |
| 83 | July 10 | 9 | 5211.63 | 150 | 6 | v6-8d | 32.4 ..... | ... | ... | ... | ... | .... |
| | | | | 40 | 6 | v3 1U, R8v | 35.6, 31.0 | 33.6 | 9.87 | fair | 65 | +0.32 |
| 84 | 21 | 9 | 5222.61 | 40 | 6 | R3v, v4 1U | 36.0, 36.6 | 36.3 | 9.52 | fair | 76 | +0.44 |
| 85 | 25 | 9 | 5226.63 | 80 | 12 | R1v, v5 1U | 38.0, 37.6 | 37.8 | 9.24 | good | 80 | +0.25 |
| | | | | 3 | 3 | R1v, v5 1U | 38.0, 37.6 ..... | ... | ... | ... | ... | .... |
| 86 | 28 | 8 | 5229.58 | 40 | 6 | R2v, v3 1U | 37.0, 35.6 | 36.6 | 9.52 | good | 83 | +0.62 |
| | | | | 40 | 6 | photometer ..... | ... | ... | ... | ... | ... | .... |
| 87 | Aug. 6 | 9 | 5238.60 | 150 | 6 | v2-3 1U | 36.1 | 36.0 | 9.45 | fair | 92 | +0.65 |
| | | | | 40 | 6 | R3v | 36.0 ..... | ... | ... | ... | ... | .... |
| 88 | 13 | 8 | 5245.58 | 40 | 6 | photometer | ... | ... | 9.24 | .... | ... | .... |
| 89 | 13 | 9 | 5245.58 | 40 | 6 | v2R, v6-8 1U | 41.0, 39.6 | 40.3 | 9.05 | good | 99 | +0.30 |
| 90 | 14 | 8 | 5246.58 | 40 | 6 | v1-2R | ... | 40.5 | 9.02 | good | 100 | +0.22 |
| 91 | 18 | 8 | 5250.58 | 150 | 6 | v4-5 1U | 37.1 ..... | ... | ... | ... | ... | .... |
| | | | | 40 | 6 | R1v | 38.0 | 37.6 | 9.38 | good | 104 | +0.58 |
| 92 | Oct. 25 | 17 | 5318.54 | 67 | 12 | d1v, v1e | 24.4, 22.3 | 23.4 | 11.18 | fair | 172 | +0.48 |
| 1901 | | | | | | | | | | | | |
| 93 | May 18 | 13 | 5523.77 | 80 | 12 | vz, near limit | ... | 11.3 | 12.85 | fair | 17 | +0.45 |
| 1902 | | | | | | | | | | | | |
| 94 | Jan. 10 | 14 | 5760.83 | 237 | 40 | photometer | ... | ... | 12.80 | poor | 254 | -0.02 |
| 95 | Feb. 11 | 12 | 5792.75 | 237 | 40 | photometer | ... | ... | 13.42 | fair | 286 | +0.10 |
| 96 | 22 | ... | 5803 | ... | 24 | photograph ..... | ... | ... | ... | .... | ... | .... |
| 97 | Mar. 15 | 13 | 5824.79 | 350 | 40 | z5-6v, vε, v3y, v4a | 5.8, 9.0 7.0, 7.0 .. | 6.6 | 13.57 | fair | 318 | -0.13 |
| 98 | Apr. 12 | 12 | 5852.75 | 237 | 40 | photometer | ... | ... | 13.48 | good | 346 | +0.06 |

TABLE 39.—4315 R COMÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparison. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|---|---------------------|--------|---------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1901 | | 2410000+ | | | | | | | | | |
| 99 | May 2 | 13 | 5872.77 | 237 | 40 | photometer..... | ..... | ..... | 12.71 | good | 6 | -0.17 |
| 100 | 25 | 14 | 5895.83 | 237 | 40 | photometer..... | ..... | ..... | 12.14 | fair | 29 | +0.22 |
| 101 | June 3 | 10 | 5904.67 | 67 | 12 | photometer..... | ..... | ..... | 11.49 | fine | 38 | -0.03 |
| 102 | 9 | 9 | 5910.63 | 67 | 12 | photometer..... | ..... | ..... | 11.03 | fair | 44 | -0.08 |
| 103 | 25 | 10 | 5926.67 | 67 | 12 | photometer..... | ..... | ..... | 9.43 | fair | 60 | -0.36 |
| 104 | 30 | 9 | 5931.63 | 67 | 12 | photometer..... | ..... | ..... | 8.97 | good | 65 | -0.60 |
| | 1903 | | | | | | | | | | | |
| 105 | Jan. 9 | 16 | 6124.92 | 237 | 40 | z4v, v _e (?), v8γ..... | 7.3, 9.0, 12.0..... | 8.6 | 13.28 | fair | 258 | +0.38 |
| 106 | May 17 | 9 | 6252.63 | 67 | 12 | v not seen, limit 1 ^M <d..... | ..... | ..... | <11.7 | poor | ... | .... |
| | 1904 | | | | | | | | | | | |
| 107 | Mar. 22 | 13 | 6562.79 | 237 | 40 | photometer..... | ..... | ..... | 13.50 | fine | 336 | -0.11 |
| 108 | May 3 | 10 | 6604.67 | 67 | 12 | c4-5v, v1u, v22..... | 14.1, 16.5, 13.3 .. | 14.6 | 12.9 | dull | 18 | +0.5 |
| 109 | 10 | 7 | 6611.54 | 40 | 6 | u3v, v1-22, z glimpsed..... | 12.5, 12.8..... | 12.7 | 12.67 | good | 25 | +0.58 |
| 110 | June 17 | 11 | 6649.71 | 40 | 6 | photometer..... | ..... | ..... | 10.54 | fair | 63 | +0.88 |
| 111 | July 4 | 10 | 6666.67 | 40 | 6 | photometer..... | ..... | ..... | 9.54 | fair | 80 | +0.55 |
| 112 | 9 | 9 | 6671.63 | 40 | 6 | photometer..... | ..... | ..... | 9.29 | good | 85 | +0.39 |
| 113 | Aug. 2 | .. | 6695.6 | 67 | 12 | photometer..... | ..... | ..... | 8.41 | good | 109 | -0.39 |
| 114 | 27 | 8 | 6720.58 | 40 | 6 | P1-2v, a or R not seen..... | ..... | 42.7 | 8.78 | good | 134 | -0.40 |
| | 1905 | | | | | | | | | | | |
| 115 | Jan. 3 | 13 | 6849.79 | 237 | 40 | v4z..... | ..... | 15.3 | 12.29 | good | 263 | -0.70 |
| 116 | 29 | 14 | 6875.83 | 237 | 40 | z1v, v1e..... | 10.3, 10.0..... | 10.2 | 13.00 | good | 289 | -0.39 |
| 117 | Feb. 27 | 10 | 6904.67 | 67 | 12 | v not seen, limit z..... | ..... | <11.3 | <12.9 | good | 318 | -0.39 |
| | | | | 275 | 12 | v glimpsed? z3v±..... | ..... | 8.3 | 13.31 | | | |
| 118 | Mar. 5 | 15 | 6910.88 | 237 | 40 | e4-5v, v1γ, or vγ, v1a..... | 4.5, 4.5, 4.0 .. | 4.3 | 13.90 | good | 324 | +0.21 |
| | | | | 237 | 40 | photometer..... | ..... |  |  |  |  |  |
| 119 | 12 | 13 | 6917.77 | 237 | 40 | e3v, v3γ..... | 6.0, 7.0..... | 6.5 | 13.59 | good | 331 | -0.10 |
| 120 | 24 | 9 | 6929.60 | 150 | 6 | (u and companion both seen, z limit, about 12 ^M .6, v (not seen.)..... | ..... | <11 | <12.9 | fair | | |
| 121 | 25 | 10 | 6930.67 | 250 | 40 | z5v, e1v, v4γ..... | 6.3, 8.0, 8.0..... | 7.4 | 13.45 | good | 344 | -0.03 |
| 122 | 26 | 10 | 6931.67 | 237 | 40 | photometer..... | ..... | ..... | (14.42) | fair | 354 | +0.17 |
| 123 | Apr. 1 | 9 | 6937.63 | 237 | 40 | photometer..... | ..... | ..... | 13.76 | fair | 351 | +0.46 |
| 124 | 4 | 14 | 6940.83 | 237 | 40 | e1v, v3γ..... | 8.0, 7.0..... | 7.5 | 13.43 | good | 358 | +0.05 |
| | | | | 237 | 40 | photometer..... | ..... | ..... |  |  |  |  |
| 125 | 8 | 9 | 6944.63 | 237 | 40 | e0-1v, v6γ..... | 8.5, 10.0..... | 9.0 | 13.20 | fair | 1 | +0.60 |
| 126 | 11 | 15 | 6947.96 | 237 | 40 | e2v, v3-4γ..... | 7.0, 7.5..... | 7.2 | 13.48 | low | 12 | 0.50 |
| 127 | 30 | 10 | 6966.67 | 237 | 40 | v 5-6γ, v2ε, v2..... | 9.5, 11.0, 11.3.... | 10.8 | 12.92 | good | 20 | +0.72 |
| 128 | May 31 | 9 | 6997.63 | 150 | 6 | d4v, v _e , v6=8b..... | 21.4, 21.3, 24.1 .. | 21.0 | 11.50 | fair | 51 | +0.90 |
| 129 | June 22 | 9 | 7019.63 | 40 | 6 | R2v, v-1U..... | 37.0, 32.6..... | 33.3 | 9.90 | poor | 73 | +0.70 |
| | | | | 150 | 6 | v5d..... | 30.4..... | | | | | |
| 130 | July 24 | 9 | 7051.63 | 40 | 6 | P3v, v _a , v6R..... | 41.2, 40.9, 45.0 .. | 41.7 | 8.90 | good | 105 | +0.12 |
| 131 | Aug. 9 | 8 | 7067.60 | 40 | 6 | P6v, a1v..... | 38.2, 39.9..... | 39.3 | 9.18 | fair | 121 | +0.27 |

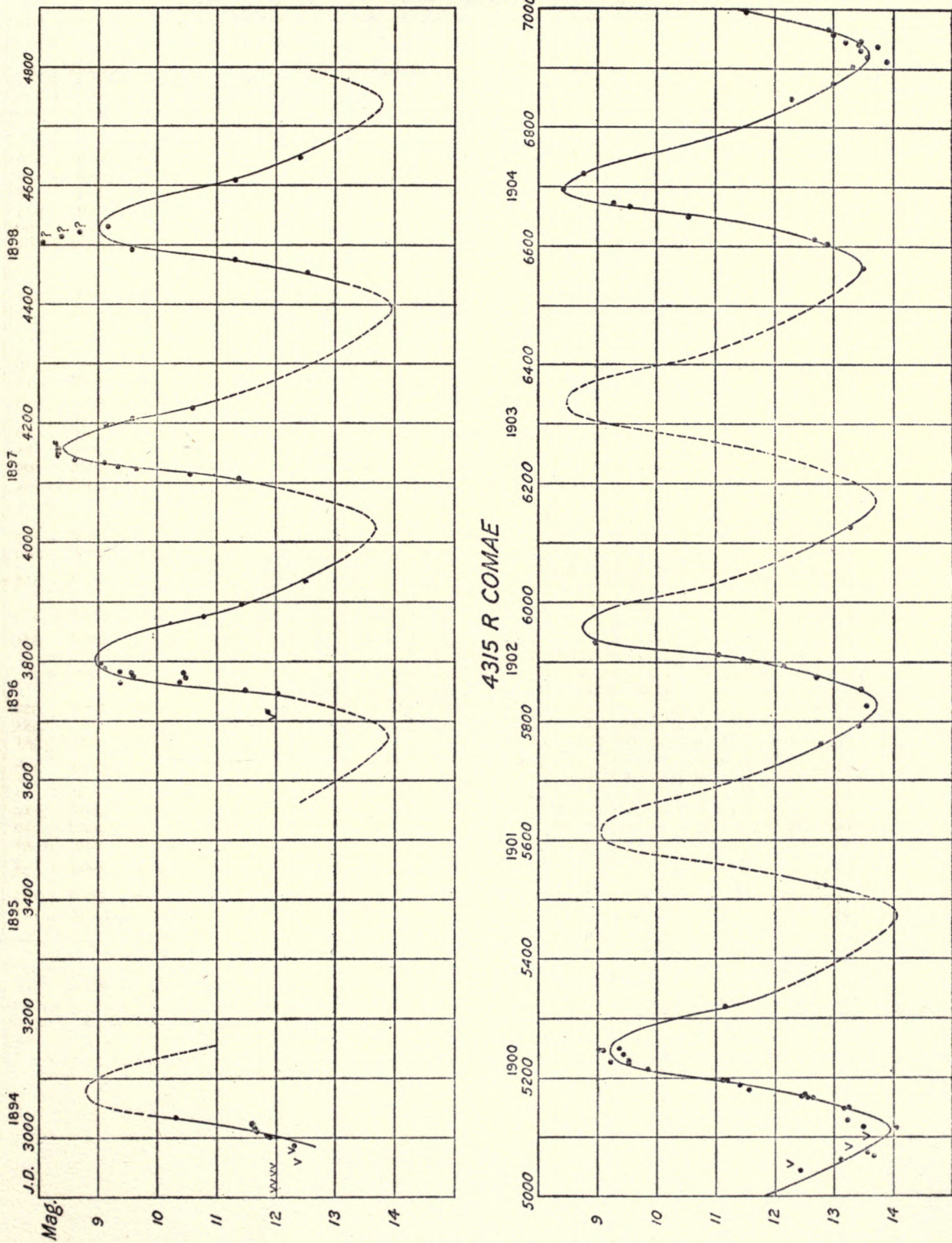


FIG. 14.—LIGHT-CURVE OF R COMÆ.

TABLE 40.—4315 R COMÆ. MEAN MAGNITUDES FROM 30 DAY GROUPS.

| Group No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|------------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 |
| 2986 { | <i>t</i> | 14 | 38 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | 11.87 | 10.94 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | -0.62 | -0.46 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | 4 | 2 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| 3706 { | <i>t</i> | 11 | 48 | 76 | 92 | .... | 170 | 190 | 227 | .... | .... | .... |
| | <i>M</i> | 11.88 | 10.96 | 9.39 | 9.03 | .... | 10.79 | 11.42 | 12.50 | .... | .... | .... |
| | ΔM | -0.73 | +0.18 | +0.24 | +0.22 | .... | +0.24 | +0.02 | +0.28 | .... | .... | .... |
| | No. | 1 | 3 | 4 | 1 | .... | 1 | 1 | 1 | .... | .... | .... |
| 4066 { | <i>t</i> | .... | 49 | 74 | 95 | 136 | 157 | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | 10.55 | 8.68 | 8.32 | 9.38 | 10.60 | .... | .... | .... | .... | .... |
| | ΔM | .... | -0.25 | -0.47 | -0.48 | +0.16 | +0.58 | .... | .... | .... | .... | .... |
| | No. | .... | 3 | 6 | 5 | 2 | 1 | .... | .... | .... | .... | .... |
| 4426 { | <i>t</i> | 29 | 50 | 76 | 102 | .... | .... | 182 | 222 | .... | .... | .... |
| | <i>M</i> | 12.52 | 11.30 | 8.65 | 8.95 | .... | .... | 11.30 | 12.38 | .... | .... | .... |
| | ΔM | +0.57 | +0.60 | -0.50 | +0.11 | .... | .... | +0.22 | +0.24 | .... | .... | .... |
| | No. | 1 | 1 | 3 | 3 | .... | .... | 1 | 1 | .... | .... | .... |
| 4786 { | <i>t</i> | .... | .... | .... | .... | .... | .... | 218 | 254 | 281 | 322 | 336 |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | 11.88 | 12.42 | 13.45 | 14.00 | 13.36 |
| | ΔM | .... | .... | .... | .... | .... | .... | -0.17 | -0.21 | +0.18 | +0.30 | -0.29 |
| | No. | .... | .... | .... | .... | .... | .... | 1 | 1 | 3 | 2 | 2 |
| 5146 { | <i>t</i> | 15 | 43 | 76 | 99 | .... | 172 | .... | .... | .... | .... | .... |
| | <i>M</i> | 12.58 | 11.32 | 9.54 | 9.24 | .... | 11.18 | .... | .... | .... | .... | .... |
| | ΔM | +0.22 | +0.13 | +0.41 | +0.44 | .... | +0.48 | .... | .... | .... | .... | .... |
| | No. | 7 | 4 | 4 | 4 | .... | 2 | .... | .... | .... | .... | .... |
| 5506 { | <i>t</i> | 17 | .... | .... | .... | .... | .... | .... | 254 | 286 | 318 | 346 |
| | <i>M</i> | 12.85 | .... | .... | .... | .... | .... | .... | 12.80 | 13.42 | 13.57 | 13.48 |
| | ΔM | +0.45 | .... | .... | .... | .... | .... | .... | -0.02 | +0.10 | -0.13 | +0.06 |
| | No. | 1 | .... | .... | .... | .... | .... | .... | 1 | 1 | 1 | 1 |
| 5866 { | <i>t</i> | 18 | 41 | 62 | .... | .... | .... | .... | 258 | .... | .... | 336 |
| | <i>M</i> | 12.42 | 11.26 | 9.20 | .... | .... | .... | .... | 13.28 | .... | .... | 13.50 |
| | ΔM | +0.02 | -0.06 | -0.48 | .... | .... | .... | .... | +0.38 | .... | .... | -0.11 |
| | No. | 2 | 2 | 2 | .... | .... | .... | .... | 1 | .... | .... | 1 |
| 6586 { | <i>t</i> | 22 | .... | 76 | 109 | 134 | .... | .... | 263 | 289 | 321 | 343 |
| | <i>M</i> | 12.8± | .... | 9.46 | 8.41 | 8.78 | .... | .... | 12.29 | 13.00 | 13.61 | 13.56 |
| | ΔM | +0.5± | .... | +0.61 | -0.39 | -0.40 | .... | .... | -0.70 | -0.39 | -0.09 | +0.14 |
| | No. | 2 | .... | 3 | 1 | 1 | .... | .... | 1 | 1 | 2 | 4 |
| 6946 { | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Means { | <i>t</i> | 17 | 45 | 74 | 98 | 135 | 168 | 186 | 222 | 257 | 284 | 321 |
| | <i>M</i> | 12.40 | 11.03 | 9.12 | 8.78 | 9.18 | 10.94 | 11.36 | 12.25 | 12.70 | 13.35 | 13.76 |
| | ΔM | ±0.02 | -0.01 | -0.03 | -0.03 | -0.03 | +0.43 | +0.12 | +0.12 | -0.14 | +0.05 | +0.06 |
| | No. | 18 | 15 | 22 | 14 | 3 | 4 | 2 | 3 | 4 | 5 | 5 |

TABLE 41.—4315 R COMÆ. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1856 Dec. 20 (J. D. 2399304)+361.8^d E. $M - m = 119^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|------|------|-------|-----|---------|--------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 38 | 1894 Sept. 3 | 3075 | mc | .... | +23 | 4 | 40 | 1896 Apr. 30 | 3680 | mc | .... | +23 | 2 |
| 40 | 1896 Aug. 30 | 3802 | 8.92 | 9.22 | +26 | 13 | 41 | 1897 Apr. 14 | 4029 | mc | .... | +9 | 4 |
| 41 | 1897 Aug. 19 | 4156 | 8.40 | 8.70 | +18 | 23 | 42 | 1898 Apr. 13 | 4393 | mc | .... | +12 | 4 |
| 42 | 1898 Aug. 23 | 4525 | 9.0± | 9.3± | +25 | 15 | 43 | 1899 Apr. 1 | 4746 | mc | .... | +4 | 2 |
| 44 | 1900 Aug. 10 | 5242 | 9.20 | 9.50 | +19 | 17 | 44 | 1900 Apr. 1 | 5111 | 13.98 | 14.28 | +7 | 27 |
| 45 | 1901 Aug. 15 | 5612 | mc | .... | +27 | 1 | 45 | 1901 Mar. 26 | 5470 | mc | .... | +4 | 3 |
| 46 | 1902 July 29 | 5960 | mc | .... | +13 | 4 | 46 | 1902 Mar. 17 | 5826 | 13.73 | 14.03 | -2 | 11 |
| 48 | 1904 July 28 | 6690 | 8.40 | 8.70 | +20 | 5 | 47 | 1903 Feb. 25 | 6171 | 13.7± | 14.0± | -19 | 1 |
| 49 | 1905 July 24 | 7051 | 8.90 | 9.20 | +19 | 5 | 48 | 1904 Mar. 24 | 6564 | mc | .... | +13 | 3 |
| | | | | | | | 49 | 1905 Mar. 17 | 6922 | 13.67 | 13.97 | +9 | 18 |

TABLE 42.—R COMÆ. VARIOUS DETERMINATIONS OF COMPARISON STARS.

| Star. | Hagen. | HCO. | H. M. Parkhurst. | J. A. Parkhurst. | |
|-----------|--------|-------|---------------------|---------------------|-------|
| | | | | H. | P. |
| <i>F</i> | 8.2 | 7.61 | 7.82 | 7.62 | 7.92 |
| <i>a</i> | 8.6 | .... | 8.90 | 9.09 | 9.39 |
| <i>R</i> | 8.8 | 9.01 | 9.36 | 9.15 | 9.45 |
| <i>1U</i> | 9.3 | 9.62 | 10.11 | 10.14 | 10.44 |
| <i>d</i> | 10.0 | 10.81 | 10.97 | 10.67 | 10.97 |
| <i>c</i> | 10.8 | 12.46 | .... | 12.43 | 12.73 |
| <i>u</i> | .... | 13.20 | .... | 12.81 | 13.11 |

Some of the various magnitude scales for the comparison stars are collected in Table 42. It will be seen that the Hagen scale is very much compressed, the interval between *F* and *c* being only 2.6 magnitudes, whereas it is 4.81 by my measures and 4.85 by the Harvard measures. This may be due in part to the yellow color of the star *F*, but seems mainly due to the star *c*. No magnitudes have heretofore been published for stars suitable for comparison with the variable near minimum, evidently because it has not been observed at that part of the light curve.

The redness of the variable is given as 4.0 in Chandler's Third Catalogue. Photographically it is at least one magnitude fainter than *r* at minimum.

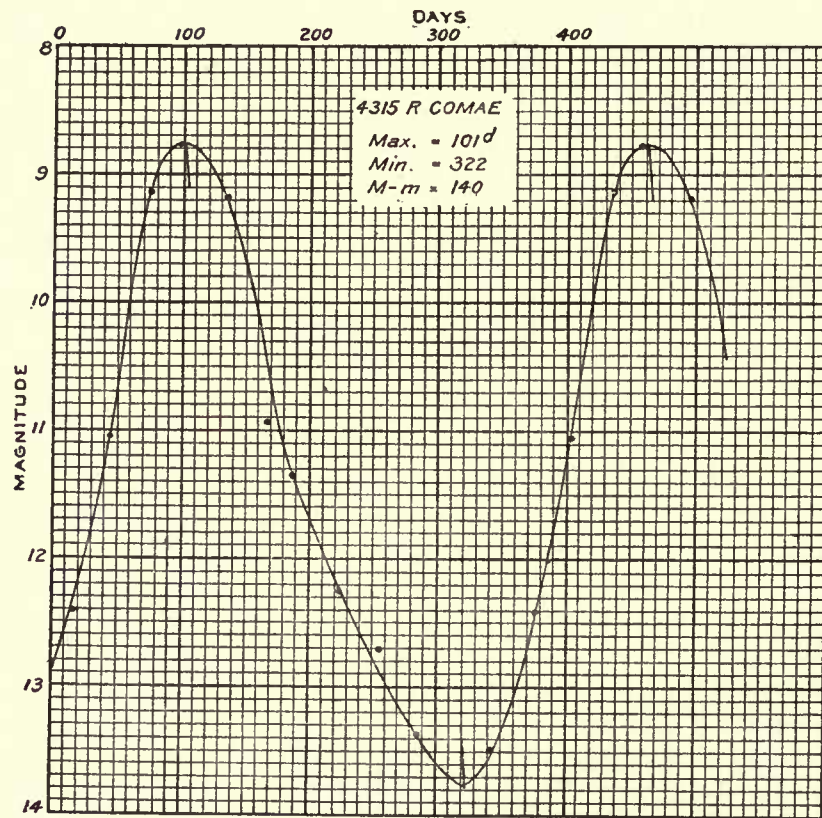


FIG. 15.—MEAN LIGHT-CURVE OF R COMÆ.

CHAPTER VI.

5798 RU HERCULIS.

R. A. $16^{\text{h}} 6^{\text{m}} 2^{\text{s}}.7$; Dec. $+25^{\circ} 19' 56''$ (1900).

This is another of Anderson's discoveries, to which Chandler assigned the above notation in the *Astronomical Journal* 17, 64. Some confusion may arise from the number 5796_a being given it in the *Astronomische Nachrichten*. The announcement of discovery was made in 1896 and observations began in January, 1897. One other series has been published by H. M. Parkhurst and A. C. Perry. The details of Hartwig's observations have not appeared, while Esch has published only three comparisons.

The places of the brighter comparison stars were measured in July, 1897, with the 6-inch, and the fainter stars *o*, *m*, *n* and *g* in June, 1900, with the 40-inch. These places have all been checked on the photograph. The star *p* was selected and used with the 6-inch, but its photometric magnitude was measured only with the 40-inch, and seems to be too large numerically.

The place of the variable given above was found by applying the coordinates in Table 45 to the Cambridge A. G. positions of the stars *a*, *b*, *s*, and *l*. It agrees closely with that given by Hartwig.

The light curve shows considerable range in the magnitude at maximum, at least from 7.4 to 8.8 on the Harvard system, with the alternate maxima bright. The minima are more uniform at about 14.0. There is an unmistakable halt in both branches of the curve, at somewhat different magnitudes. This does not amount to a secondary maximum, if we may trust the evidence before us.

The last comparison used in forming the mean light curve is that of 1905, January 12.

5798 RU HERCULIS.

TABLE 43.—STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color P.D.M. | Magnitude. | | | | Residuals. | | |
|----------|----------------|--------------|--------------|-----------------|------------|--------|-----------|------|------------|-----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P.D.M. | H. | P. | H. | P. | |
| <i>B</i> | ° | <i>h m s</i> | <i>° ' "</i> | | | | | | | | |
| <i>C</i> | +27 2595 | 16 05 58 | +27 00.5 | GW+ | 6.68 | 6.88 | 6.62 | 6.89 | − 6 | + 1 | ± 7 |
| <i>l</i> | +27 2597 | 16 07 01 | +27 09.8 | GW− | 7.37 | 7.80 | 7.53 | 7.80 | +16 | 0 | ± 2 |
| | +25 3039 | 16 05 56 | +25 44.8 | GW− | 7.48 | 7.68 | 7.39 | 7.66 | − 9 | − 2 | ± 4 |
| | Mean . . . . . | ..... | ..... | ..... | 7.18 | 7.45 | 7.18 | 7.45 | ±10 | ± 1 | ± 4 |

RESEARCHES IN STELLAR PHOTOMETRY.

TABLE 44.—5798 RU HERCULIS. COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|----------|------|--------------|----------|----------|----------|--------------|---------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | | | | | | | | | |
| | ° | | <i>h m s</i> | ° | | ° | <i>h m s</i> | ° | |
| <i>u</i> | +25 3031 | 8.3 | 16 1 21 | +25 17.9 | <i>x</i> | +25 3040 | 9.5 | 16 4 28 | +25 50.0 |
| <i>t</i> | +25 3036 | 8.4 | 16 2 48 | +25 18.8 | <i>a</i> | +25 3042 | 8.5 | 16 5 19 | +25 20.2 |
| <i>z</i> | +25 3037 | 9.5 | 16 3 29 | +25 53.5 | <i>s</i> | +25 3044 | 8.8 | 16 5 23 | +25 48.2 |
| <i>w</i> | +25 3038 | 9.5 | 16 4 2 | +25 6.5 | <i>b</i> | +25 3046 | 9.0 | 16 5 48 | +25 36.5 |

TABLE 45.—COMPARISON STARS FOR RU HERCULIS.

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|-----------|----------------------------|----------|-------|---------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | H. | P. | H. | P. | H. | P. | H. | P. |
| | " | <i>s</i> | " | | | | | |
| <i>u</i> | -2273 | -167.9 | -558 | 26.5 | ..... | ..... | 8.81 | 9.08 |
| <i>t</i> | -1110 | -82.0 | -493 | 26.7 | ..... | ..... | 8.80 | 9.07 |
| <i>z</i> | -560 | -41.4 | +1580 | 17.0 | 10.15 | 10.42 | ..... | ..... |
| <i>w'</i> | -208 | -15.4 | +1 | -7.5 | 14.68 | 14.95 | ..... | ..... |
| <i>y</i> | -199 | -14.7 | +2575 | 17.5 | ..... | ..... | 10.36 | 10.63 |
| <i>p</i> | -179 | -13.2 | -315 | 0 | 13.42 | 13.69 | ..... | ..... |
| <i>t'</i> | -99 | -7.3 | -12 | -9.1 | 15.23 | 15.50 | ..... | ..... |
| <i>r</i> | -94 | -6.9 | -546 | .... | ..... | ..... | ..... | ..... |
| <i>l</i> | -87 | -6.4 | +1491 | 34.0 | 7.39 | 7.66 | ..... | ..... |
| <i>w</i> | -84 | -6.2 | -1239 | 15.0 | ..... | ..... | 10.77 | 11.04 |
| <i>f</i> | -59 | -4.4 | +368 | 10.0 | ..... | ..... | 11.64 | 11.91 |
| <i>q</i> | +24 | +1.8 | -481 | 12.0 | ..... | ..... | 11.29 | 11.56 |
| <i>n</i> | +35 | +2.6 | -184 | 2.8 | 12.75 | 13.02 | ..... | ..... |
| <i>m</i> | +44 | +3.3 | -243 | 4.1 | 12.40 | 12.67 | ..... | ..... |
| <i>g</i> | +91 | +6.7 | -49 | 8.0 | 11.96 | 12.23 | ..... | ..... |
| <i>h</i> | +187 | +13.8 | +191 | 6.0 | 12.06 | 12.33 | ..... | ..... |
| <i>x</i> | +232 | +17.1 | +1342 | 16.4 | ..... | ..... | 10.54 | 10.81 |
| <i>c</i> | +267 | +19.7 | +669 | 14.0 | ..... | ..... | 10.94 | 11.21 |
| <i>e</i> | +313 | +23.1 | +423 | 10.1 | 11.39 | 11.66 | ..... | ..... |
| <i>d</i> | +473 | +35.0 | +771 | 13.1 | ..... | ..... | 11.09 | 11.36 |
| <i>a</i> | +921 | +68.1 | -384 | 29.7 | 8.61 | 8.88 | ..... | ..... |
| <i>s</i> | +981 | +72.5 | +1239 | 26.9 | 9.22 | 9.49 | ..... | ..... |
| <i>b</i> | +1335 | +98.6 | +580 | 21.0 | 9.58 | 9.85 | ..... | ..... |

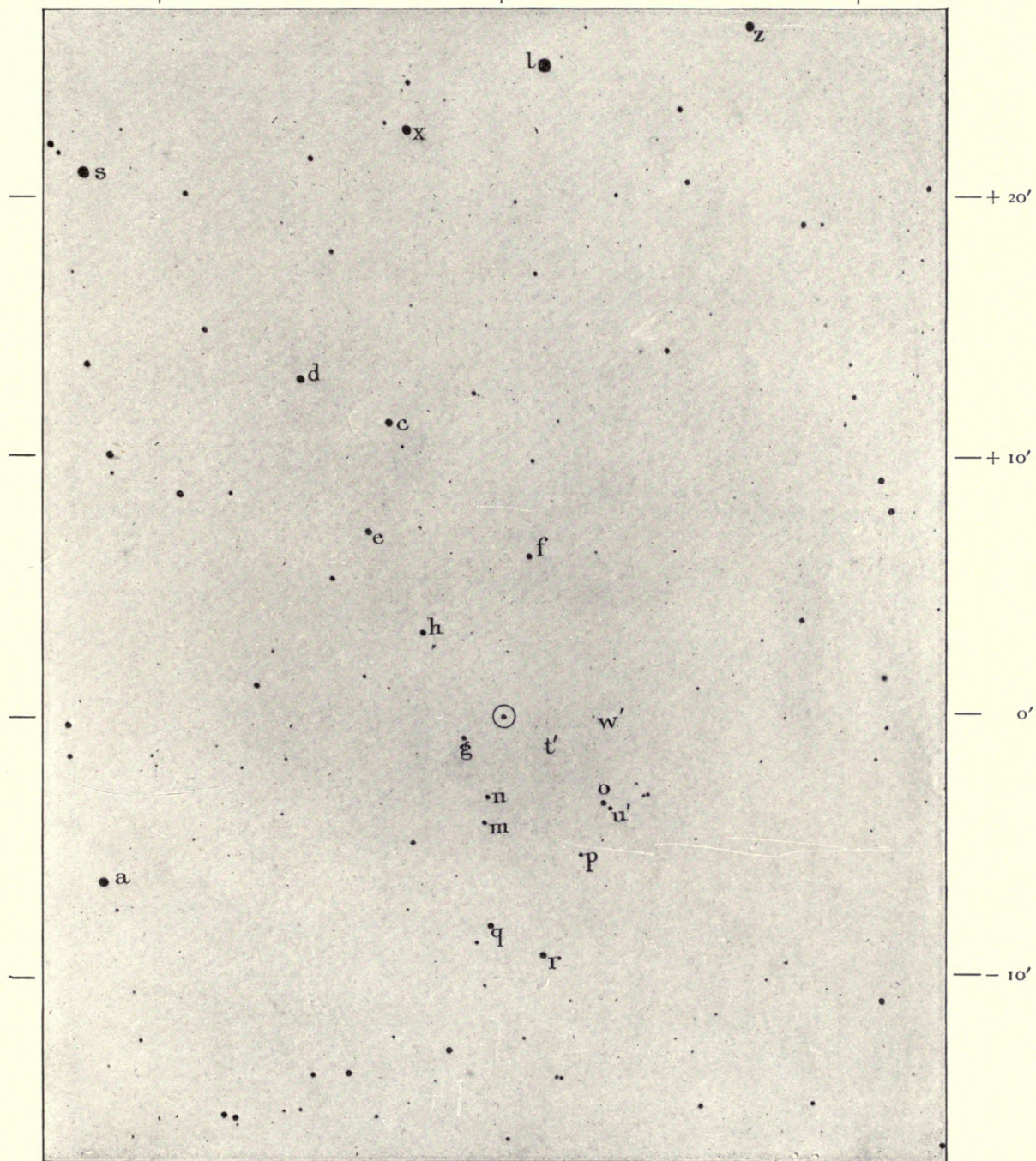
STELLAR PHOTOMETRY.

N
0m

PLATE 6.

+ 1m

- 1m



Scale, 1 mm = 15".3.

S

1904 June 8.

5798 RU HERCULIS.

R. A. 16^h 6^m 28.7. Dec. + 25° 19' 56", 1900.

TABLE 46.—5798 RU HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.

| 1904 July 31 | | | 6-INCH. | | | Good; twilight at beginning. | | |
|-------------------|------------|-----------------------|-----------------------------------|----------------------|------------|------------------------------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 17 05 | 20 | <i>C</i> | 11.1 11.7 10.3 | 11.03 | 11.07 | 0.40 | 7.56 | 7.83 |
| | | <i>B₄₁</i> | 7.0 8.1 8.7 | 7.93 | 8.53 | 0.16 | 7.32 | 7.59 |
| | | <i>l</i> | 9.2 9.0 9.1 | 9.10 | 9.44 | 0.24 | 7.40 | 7.67 |
| | | <i>z</i> | 34.1 34.0 32.9 | 33.67 | 33.89 | 3.17 | 10.33 | 10.60 |
| | | <i>s</i> | 25.3 25.0 25.3 | 25.20 | 25.85 | 2.22 | 9.38 | 9.65 |
| | | <i>b</i> | 27.8 28.2 27.6 | 27.87 | 27.89 | 2.44 | 9.60 | 9.87 |
| | | <i>a</i> | 18.7 18.9 18.6 | 18.73 | 18.95 | 1.47 | 8.63 | 8.90 |
| | | <i>v</i> | 42.8 41.5 42.7 | 42.33 | ..... | 4.05 | 11.21 | 11.48 |
| | | <i>a</i> | 18.8 18.9 19.8 | 19.17 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 28.0 27.8 27.9 | 27.90 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 26.6 26.8 26.1 | 26.50 | ..... | ..... | ..... | ..... |
| | 24 | <i>z</i> | 33.8 34.5 34.0 | 34.10 | ..... | ..... | ..... | ..... |
| | 24 | <i>l</i> | 10.3 8.7 10.3 | 9.77 | ..... | ..... | ..... | ..... |
| | | <i>B₄₁</i> | 9.0 9.2 9.2 | 9.13 | ..... | ..... | ..... | ..... |
| | | <i>C₄₁</i> | 16.7 17.0 16.0 | 16.57 | ..... | ..... | ..... | ..... |
| 17 25 | 23 | <i>C</i> | 11.2 11.2 10.9 | 11.10 | ..... | ..... | ..... | ..... |
| 1904 September 3. | | | Good; twilight at beginning. | | | | | |
| 18 24 | 34 | <i>B₄₁</i> | 7.0 6.9 7.9 | 7.27 | 7.17 | 0.07 | 7.31 | 7.58 |
| | | <i>C₄₁</i> | 15.3 16.0 16.3 | 15.87 | ..... | 1.06 | 8.30 | 8.57 |
| | | <i>C</i> | 9.2 10.1 9.2 | 9.50 | 9.75 | 0.27 | 7.51 | 7.78 |
| | | <i>l</i> | 8.0 8.0 7.7 | 7.90 | 7.79 | 0.11 | 7.35 | 7.62 |
| | | <i>l₄₁</i> | 15.9 16.7 16.1 | 16.23 | ..... | 1.12 | 8.36 | 8.63 |
| | | <i>z</i> | 30.1 30.5 31.2 | 30.60 | 31.44 | 2.85 | 10.09 | 10.36 |
| | 36 | <i>s</i> | 21.1 21.5 21.8 | 21.47 | 22.92 | 1.92 | 9.16 | 9.43 |
| | | <i>b</i> | 24.7 25.2 25.0 | 24.97 | 25.80 | 2.22 | 9.46 | 9.73 |
| | | <i>a</i> | 17.2 17.7 18.1 | 17.67 | 17.69 | 1.31 | 8.55 | 8.82 |
| | | <i>v</i> | 27.1 27.2 27.8 | 27.27 | ..... | 2.38 | 9.62 | 9.89 |
| | | <i>a</i> | 17.5 16.8 18.5 | 17.60 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 26.2 26.9 26.8 | 26.63 | ..... | ..... | ..... | ..... |
| | 37 | <i>s</i> | 24.9 24.0 24.2 | 24.37 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 32.5 32.2 32.1 | 32.27 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 8.2 7.0 7.8 | 7.67 | ..... | ..... | ..... | ..... |
| | | <i>C</i> | 10.0 9.8 10.2 | 10.00 | ..... | ..... | ..... | ..... |
| 18 48 | 37 | <i>B₄₁</i> | 6.8 6.3 8.1 | 7.07 | ..... | ..... | ..... | ..... |
| 1904 September 4. | | | Quiet; stars dull; fair measures. | | | | | |
| 19 18 | 41 | <i>C</i> | 13.3 14.3 14.2 | 13.93 | 14.00 | 0.79 | 7.49 | 7.76 |
| | | <i>B₄₁</i> | 14.3 14.0 13.9 | 14.07 | 13.95 | 0.78 | 7.48 | 7.75 |
| | | <i>l</i> | 12.9 13.3 12.8 | 13.00 | 12.97 | 0.63 | 7.33 | 7.60 |
| | | <i>z</i> | 35.6 34.5 35.1 | 35.07 | 35.90 | 3.45 | 10.15 | 10.42 |
| | | <i>s</i> | 28.6 29.2 28.8 | 28.87 | 28.47 | 2.51 | 9.21 | 9.48 |
| | | <i>b</i> | 30.3 30.6 30.5 | 30.47 | 29.82 | 2.67 | 9.37 | 9.64 |
| | | <i>a</i> | 24.2 25.2 24.5 | 24.63 | 24.32 | 2.07 | 8.77 | 9.04 |
| | 43 | <i>a</i> | 23.8 24.1 24.1 | 24.00 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 28.7 29.0 29.8 | 29.17 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 28.2 28.2 27.8 | 28.07 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 37.0 36.8 36.4 | 36.73 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 13.0 12.9 12.9 | 12.93 | ..... | ..... | ..... | ..... |
| | | <i>B₄₁</i> | 13.7 13.4 14.4 | 13.83 | ..... | ..... | ..... | ..... |
| 19 22 | 43 | <i>C</i> | 13.4 14.2 14.6 | 14.07 | ..... | ..... | ..... | ..... |

TABLE 46.—5798 RU HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 August 11. | | | 12-INCH. | | | | Good. | | |
|-------------------|------------|----------|-----------------------------------|----------------------|------------|-------|------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| 18 2 | 29 | <i>m</i> | 54.8 54.3 53.5 | 54.20 | 53.30 | 5.10 | 12.55 | 12.82 | |
| | | <i>n</i> | 57.4 58.2 58.3 | 57.97 | 56.79 | 5.33 | 12.78 | 13.05 | |
| | | <i>v</i> | 34.5 35.8 35.4 | 35.23 | ..... | 3.22 | 10.67 | 10.94 | |
| | | <i>g</i> | 46.4 46.4 46.9 | 46.57 | 48.05 | 4.63 | 12.08 | 12.35 | |
| | | <i>h</i> | 48.3 47.8 47.3 | 47.80 | 48.19 | 4.59 | 12.04 | 12.31 | |
| | | <i>e</i> | 43.0 42.9 43.1 | 43.00 | 42.52 | 4.06 | 11.51 | 11.78 | |
| | | <i>a</i> | 15.0 14.9 14.8 | 14.90 | 15.25 | 1.08 | 8.53 | 8.80 | |
| | | <i>b</i> | 23.9 24.0 25.0 | 24.30 | 23.89 | 2.10 | 9.55 | 9.82 | |
| | | <i>s</i> | 18.5 18.7 19.2 | 18.80 | 20.77 | 1.80 | 9.25 | 9.52 | |
| | | <i>z</i> | 30.6 31.2 30.6 | 30.80 | 31.14 | 2.77 | 10.22 | 10.49 | |
| | | <i>z</i> | 31.8 31.1 31.5 | 31.47 | ..... | ..... | ..... | ..... |  |
| | | <i>s</i> | 22.0 23.7 22.5 | 22.73 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 23.1 23.5 23.8 | 23.47 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 15.7 16.0 15.1 | 15.60 | ..... | ..... | ..... | ..... |  |
| | | <i>e</i> | 42.0 42.0 42.2 | 42.07 | ..... | ..... | ..... | ..... |  |
| | | <i>h</i> | 48.1 49.2 48.4 | 48.57 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 49.1 50.7 48.8 | 49.53 | ..... | ..... | ..... | ..... |  |
| | | <i>n</i> | 55.1 55.7 56.0 | 55.60 | ..... | ..... | ..... | ..... |  |
| | | <i>m</i> | 52.4 52.8 52.0 | 52.40 | ..... | ..... | ..... | ..... |  |
| 1904 September 8. | | | Fair to good; quiet; rather dull. | | | | | | |
| 19 20 | 42 | <i>z</i> | 24.6 24.2 23.2 | 24.00 | 24.99 | 2.20 | 10.13 | 10.40 | |
| | | <i>s</i> | 16.9 16.8 15.9 | 16.53 | 16.47 | 1.25 | 9.18 | 9.45 | |
| | | <i>b</i> | 18.1 18.6 18.9 | 18.53 | 19.43 | 1.63 | 9.56 | 9.83 | |
| | | <i>a</i> | 11.8 12.2 12.4 | 12.13 | 12.75 | 0.76 | 8.69 | 8.96 | |
| | | <i>m</i> | 47.0 46.1 46.2 | 46.43 | 45.00 | 4.33 | 12.26 | 12.53 | |
| | | <i>n</i> | 50.3 50.0 49.1 | 49.80 | 50.44 | 4.85 | 12.78 | 13.05 | |
| | | <i>g</i> | 40.0 40.6 40.6 | 40.40 | 40.63 | 3.85 | 11.78 | 12.05 | |
| | | <i>v</i> | 17.8 15.3 16.2 | 16.43 | 16.70 | 1.29 | 9.22 | 9.49 | |
| | | <i>h</i> | 43.7 43.1 43.6 | 43.47 | 43.20 | 4.12 | 12.05 | 12.32 | |
| | | <i>e</i> | 36.1 35.7 36.3 | 36.03 | 36.50 | 3.37 | 11.30 | 11.57 | |
| | | <i>e</i> | 37.2 36.8 36.9 | 36.97 | ..... | ..... | ..... | ..... |  |
| | | <i>h</i> | 42.8 42.9 43.1 | 42.93 | ..... | ..... | ..... | ..... |  |
| | | <i>v</i> | 17.7 17.7 15.5 | 16.97 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 41.1 41.1 40.3 | 40.83 | ..... | ..... | ..... | ..... |  |
| | | <i>n</i> | 52.1 50.0 51.1 | 51.07 | ..... | ..... | ..... | ..... |  |
| | | <i>m</i> | 45.2 46.2 45.3 | 45.57 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 13.5 13.7 12.9 | 13.37 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 21.0 20.3 19.7 | 20.33 | ..... | ..... | ..... | ..... |  |
| | | <i>s</i> | 16.0 16.4 16.8 | 16.40 | ..... | ..... | ..... | ..... |  |
| 19 47 | 47 | <i>z</i> | 26.4 25.4 26.1 | 25.97 | ..... | ..... | ..... | ..... |  |
| 1904 September 9. | | | Quiet; quite good. | | | | | | |
| 19 0 | 39 | <i>z</i> | 30.0 30.0 29.8 | 29.93 | 30.15 | 2.67 | 10.11 | 10.38 | |
| | | <i>s</i> | 19.8 19.2 19.6 | 19.53 | 20.72 | 1.79 | 9.23 | 9.50 | |
| | | <i>b</i> | 23.2 23.5 23.2 | 23.33 | 24.77 | 2.18 | 9.62 | 9.89 | |
| | | <i>a</i> | 15.8 16.8 15.8 | 16.13 | 15.82 | 1.17 | 8.61 | 8.88 | |
| | | <i>m</i> | 51.5 51.4 50.8 | 51.57 | 51.75 | 4.96 | 12.40 | 12.67 | |
| | | <i>n</i> | 55.2 55.1 55.6 | 55.30 | 55.47 | 5.25 | 12.69 | 12.96 | |
| | | <i>v</i> | 19.6 18.8 19.8 | 19.40 | 19.10 | 1.61 | 9.05 | 9.32 | |
| | | <i>g</i> | 47.3 48.8 47.8 | 47.97 | 47.64 | 4.59 | 12.03 | 12.30 | |
| | | <i>h</i> | 50.0 49.2 49.2 | 49.47 | 48.35 | 4.65 | 12.09 | 12.36 | |
| | | <i>e</i> | 40.2 41.2 41.9 | 41.10 | 41.19 | 3.91 | 11.35 | 11.62 | |
| | | <i>e</i> | 41.0 41.2 41.6 | 41.27 | ..... | ..... | ..... | ..... |  |
| | | <i>h</i> | 46.2 47.5 48.0 | 47.23 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 47.0 47.6 47.3 | 47.30 | ..... | ..... | ..... | ..... |  |
| | | <i>v</i> | 19.8 17.8 18.8 | 18.80 | ..... | ..... | ..... | ..... |  |
| | | <i>n</i> | 54.0 55.8 57.1 | 55.63 | ..... | ..... | ..... | ..... |  |
| | | <i>m</i> | 52.0 52.1 51.7 | 51.93 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 15.2 15.8 15.5 | 15.50 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 26.7 26.3 25.6 | 26.20 | ..... | ..... | ..... | ..... |  |
| | | <i>s</i> | 22.2 21.6 21.9 | 21.90 | ..... | ..... | ..... | ..... |  |
| 19 27 | 44 | <i>z</i> | 30.6 30.5 30.0 | 30.37 | ..... | ..... | ..... | ..... |  |

TABLE 46.—5798 RU HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1902 March 5. | | | 40-INCH. | | | | Fair. | |
|----------------|------------|-----------------------|--------------------------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| 14 35 | | <i>h</i> | 22.9 23.9 24.6 | 23.80 | 23.17 | 2.04 | 12.11 | 12.38 |
| | | <i>g</i> | 22.5 21.8 23.0 | 22.43 | 22.72 | 2.00 | 12.07 | 12.34 |
| | | <i>n</i> | 30.1 30.8 29.7 | 30.20 | ..... | 2.67 | 12.74 | 13.01 |
| | | <i>m</i> | 24.8 25.0 24.7 | 24.83 | ..... | 2.18 | 12.25 | 12.52 |
| | | <i>p</i> | 35.8 35.2 34.7 | 35.23 | ..... | 3.22 | 13.29 | 13.56 |
| | | <i>w'</i> | 45.3 45.4 45.0 | 45.23 | ..... | 4.36 | 14.43 | 14.70 |
| | | <i>l'</i> | 56.4 54.0 55.0 | 55.13 | ..... | 5.24 | 15.31 | 15.58 |
| | | <i>g</i> | 23.2 23.3 22.8 | 23.10 | ..... | ..... | ..... | ..... |
| | | <i>h</i> | 23.0 22.7 21.9 | 22.53 | ..... | ..... | ..... | ..... |
| 1902 March 15. | | | Clear; unsteady. | | | | | |
| 15 10 | | <i>h</i> | 30.0 30.2 31.5 | 30.57 | 31.70 | 2.83 | 12.12 | 12.39 |
| | | <i>g</i> | 30.0 28.1 28.7 | 28.93 | 30.03 | 2.65 | 11.94 | 12.21 |
| | | <i>n</i> | 35.7 38.3 36.3 | 36.77 | 37.10 | 3.45 | 12.74 | 13.01 |
| | | <i>m</i> | 34.8 34.0 34.0 | 34.27 | 33.99 | 3.07 | 12.36 | 12.63 |
| | | <i>p</i> | 43.0 43.4 44.3 | 43.57 | 43.55 | 4.16 | 13.45 | 13.72 |
| | | <i>w'</i> | 59.2 60.0 59.0 | 59.40 | ..... | 5.46 | 14.75 | 15.02 |
| | | <i>p</i> | 42.1 44.5 43.0 | 43.53 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 33.5 34.2 33.4 | 33.70 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 38.3 37.2 36.8 | 37.43 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 31.1 32.3 30.0 | 31.13 | ..... | ..... | ..... | ..... |
| | | <i>h</i> | 34.2 33.5 31.0 | 32.83 | ..... | ..... | ..... | ..... |
| 1902 March 15. | | | Light turned down. | | | | | |
| | | <i>n</i> | 27.2 28.4 29.0 | 28.20 | 28.67 | 2.52 | 12.74 | 13.01 |
| | | <i>m</i> | 26.8 24.5 25.3 | 25.53 | 25.15 | 2.21 | 12.43 | 12.70 |
| | | <i>p</i> | 36.8 37.3 36.1 | 36.73 | 35.90 | 3.29 | 13.51 | 13.78 |
| | | <i>w'</i> | 47.8 48.8 48.0 | 48.20 | 48.22 | 4.64 | 14.86 | 15.13 |
| | | <i>l'</i> | 57.0 52.8 56.2 | 55.33 | 54.67 | 5.20 | 15.42 | 15.69 |
| | | <i>l'</i> | 53.3 54.7 54.0 | 54.00 | ..... | ..... | ..... | ..... |
| | | <i>w'</i> | 47.2 47.8 49.8 | 48.23 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 36.2 34.2 34.8 | 35.07 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 24.3 25.3 24.7 | 24.77 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 30.8 27.4 29.2 | 29.13 | ..... | ..... | ..... | ..... |
| 1902 May 2. | | | Seeing good; perhaps variable. | | | | | |
| 12 45 | | <i>f</i> | 27.4 30.1 29.9 | 29.13 | 30.16 | 2.67 | 12.20 | 12.47 |
| | | <i>h</i> | 30.0 28.5 29.0 | 29.17 | 29.20 | 2.57 | 12.10 | 12.37 |
| | | <i>g</i> | 27.1 27.8 28.2 | 27.70 | 27.84 | 2.45 | 11.93 | 12.25 |
| | | <i>n</i> | 33.2 33.5 34.4 | 33.70 | 34.69 | 3.16 | 12.69 | 12.96 |
| | | <i>m</i> | 32.2 32.9 32.3 | 32.47 | 32.15 | 2.88 | 12.41 | 12.68 |
| | | <i>v₀₂</i> | 15.7 16.5 17.3 | 16.50 | 16.14 | 1.21 | 10.74 | 11.01 |
| | | <i>l'</i> | 61.3 61.5 58.8 | 60.50 | 58.94 | 5.44 | 14.97 | 15.24 |
| | | <i>w'</i> | 55.3 55.0 55.3 | 55.20 | 54.10 | 5.16 | 14.69 | 14.96 |
| | | <i>w'</i> | 53.1 53.0 52.9 | 53.00 | ..... | ..... | ..... | ..... |
| | | <i>l'</i> | 56.3 57.5 58.3 | 57.37 | ..... | ..... | ..... | ..... |
| | | <i>v₀₂</i> | 16.0 16.1 15.2 | 15.77 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 31.9 31.7 31.9 | 31.83 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 34.8 35.0 37.2 | 35.67 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 27.5 27.5 28.9 | 27.97 | ..... | ..... | ..... | ..... |
| | | <i>h</i> | 28.1 29.1 30.5 | 29.23 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 32.4 33.3 30.4 | 31.19 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 31.0 30.9 30.4 | ..... | ..... | ..... | ..... | ..... |

TABLE 47.—5798 RU HERCULIS. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|---------------------|---------------|-----------|------|--------|-------|-------------------|-----------|------|--------|-------|-------------------|-----------|------|--------|-------|
| Star. | 1904 July 31. | | | | | 1904 September 3. | | | | | 1904 September 4. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | | |
| <i>B</i> | -0.59 | 6.57 | 6.84 | -.11 | -.04 | -0.68 | 6.56 | 6.83 | -.12 | -.05 | 0.03 | 6.73 | 7.00 | +.05 | +.12 |
| <i>C</i> | 0.40 | 7.56 | 7.83 | +.19 | +.03 | 0.29 | 7.53 | 7.80 | +.16 | .00 | 0.79 | 7.49 | 7.76 | +.12 | -.04 |
| <i>l</i> | 0.24 | 7.40 | 7.67 | -.08 | -.01 | 0.20 | 7.44 | 7.71 | -.04 | +.03 | 0.63 | 7.33 | 7.60 | -.15 | -.08 |
| Means. | 0.02 | 7.18 | 7.45 | ±.13 | ±.03 | -0.06 | 7.18 | 7.45 | ±.07 | ±.03 | 0.48 | 7.18 | 7.45 | ±.11 | ±.08 |
| M ₀.... | .... | 7.16 | 7.43 | ..... | ..... | .... | 7.24 | 7.51 | ..... | ..... | .... | 6.70 | 6.97 | ..... | ..... |

| 12-INCH. | | | | | 40-INCH. | | | | | |
|----------------------|-----------------|----------|----------|--------|----------------------|------------------|---------|----------|--------|----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | | |
| | | Sept. 9. | Aug. 11. | Sept.8 | | | Mar. 5. | Mar. 15. | May 2. | Mar. 15. |
| <i>a</i> | 8.65 | 1.17 | 1.08 | 0.76 | <i>g</i> | 11.96 | 2.00 | 2.65 | 2.45 | ..... |
| <i>b</i> | 9.48 | 2.18 | 2.10 | 1.63 | <i>h</i> | 12.06 | 2.04 | 2.83 | 2.57 | ..... |
| <i>s</i> | 9.25 | 1.79 | 1.80 | 1.25 | <i>m</i> | 12.40 | 2.18 | 3.07 | 2.88 | 2.21 |
| <i>z</i> | 10.19 | 2.67 | 2.77 | 2.20 | <i>n</i> | 12.75 | 2.67 | 3.45 | 3.16 | 2.52 |
| Mean C... | ..... | 1.95 | 1.94 | 1.46 | Mean C.... | ..... | 2.22 | 3.00 | 2.76 | 2.36 |
| Mean Mag. | 9.39 | 9.39 | 9.39 | 9.39 | Mean Mag. | 12.29 | 12.29 | 12.29 | 12.29 | 12.58 |
| M ₀..... | ..... | 7.44 | 7.45 | 7.93 | M ₀..... | ..... | 10.07 | 9.29 | 9.53 | 10.22 |

TABLE 48.—5798 RU HERCULIS. MEAN MAGNITUDES.

| 6-INCH. | | | | | | | | | |
|-----------|----------|---------------|--------------|---------------|--------------|---------------|---------|---------|---------------|
| Star. | July 31. | | September 3. | | September 4. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| B..... | 6.57 | -0.05 | 6.56 | -0.06 | 6.73 | +0.11 | 6.62 | 6.89 | ± 0.07 |
| C..... | 7.56 | +0.03 | 7.53 | 0.00 | 7.49 | -0.04 | 7.53 | 7.80 | ± 0.02 |
| l..... | 7.40 | +0.01 | 7.44 | +0.05 | 7.33 | -0.06 | 7.39 | 7.66 | ± 0.04 |
| Mean..... | | | | | | | 7.18 | 7.45 | ± 0.04 |
| a..... | 8.63 | -0.02 | 8.55 | -0.10 | 8.77 | +0.12 | 8.65 | 8.92 | ± 0.08 |
| b..... | 9.60 | +0.12 | 9.46 | -0.02 | 9.37 | -0.11 | 9.48 | 9.75 | ± 0.08 |
| s..... | 9.38 | +0.13 | 9.16 | -0.09 | 9.21 | -0.04 | 9.25 | 9.52 | ± 0.09 |
| z..... | 10.33 | +0.14 | 10.09 | -0.10 | 10.15 | -0.04 | 10.19 | 10.46 | ± 0.09 |
| Mean..... | | | | | | | 9.39 | 9.66 | ± 0.08 |

| 12-INCH. | | | | | | | | | |
|-----------|------------|---------------|--------------|---------------|--------------|---------------|---------|---------|---------------|
| Star. | August 11. | | September 8. | | September 9. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| a..... | 8.53 | -0.08 | 8.69 | +0.08 | 8.61 | 0.00 | 8.61 | 8.88 | ± 0.05 |
| b..... | 9.55 | -0.03 | 9.56 | -0.02 | 9.62 | +0.04 | 9.58 | 9.85 | ± 0.03 |
| s..... | 9.25 | +0.04 | 9.18 | -0.04 | 9.23 | +0.01 | 9.22 | 9.49 | ± 0.03 |
| z..... | 10.22 | +0.07 | 10.13 | -0.02 | 10.11 | -0.04 | 10.15 | 10.42 | ± 0.04 |
| Mean..... | | | | | | | 9.39 | 9.66 | ± 0.04 |
| e..... | 11.51 | +0.12 | 11.30 | -0.09 | 11.35 | -0.04 | 11.39 | 11.66 | ± 0.08 |
| g..... | 12.08 | +0.12 | 11.78 | -0.18 | 12.03 | +0.07 | 11.96 | 12.23 | ± 0.12 |
| h..... | 12.04 | -0.02 | 12.05 | -0.01 | 12.09 | +0.03 | 12.06 | 12.33 | ± 0.02 |
| m..... | 12.55 | +0.15 | 12.26 | -0.14 | 12.40 | 0.00 | 12.40 | 12.67 | ± 0.10 |
| n..... | 12.78 | +0.03 | 12.78 | +0.03 | 12.69 | -0.06 | 12.75 | 13.02 | ± 0.04 |
| Mean..... | | | | | | | 12.11 | 12.38 | ± 0.07 |

| 40-INCH. | | | | | | | | | | | |
|-----------|----------|---------------|-----------|---------------|-----------|---------------|--------|---------------|---------|---------|---------------|
| Star. | March 5. | | March 15. | | March 15. | | May 2. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| g... | 12.07 | +0.09 | 11.94 | -0.04 | ..... | ..... | 11.93 | -0.05 | 11.98 | 12.25 | ± 0.06 |
| h... | 12.11 | 0.00 | 12.12 | +0.01 | ..... | ..... | 12.10 | +0.01 | 12.11 | 12.38 | ± 0.01 |
| m... | 12.25 | -0.11 | 12.36 | 0.00 | 12.43 | +0.07 | 12.41 | +0.06 | 12.36 | 12.63 | ± 0.06 |
| n... | 12.74 | +0.01 | 12.74 | +0.01 | 12.74 | +0.01 | 12.69 | -0.04 | 12.73 | 13.00 | ± 0.02 |
| Mean..... | | | | | | | | | 12.30 | 12.57 | ± 0.04 |
| p... | 13.29 | -0.13 | 13.45 | +0.03 | 13.51 | +0.09 | ..... | ..... | 13.42 | 13.69 | ± 0.08 |
| i'... | 15.31 | +0.08 | ..... | ..... | 15.42 | +0.19 | 14.97 | -0.26 | 15.23 | 15.50 | ± 0.18 |
| w'... | 14.43 | -0.25 | 14.75 | +0.07 | 14.86 | +0.18 | 14.69 | +0.01 | 14.68 | 14.95 | ± 0.13 |
| Mean..... | | | | | | | | | 14.44 | 14.71 | ± 0.13 |

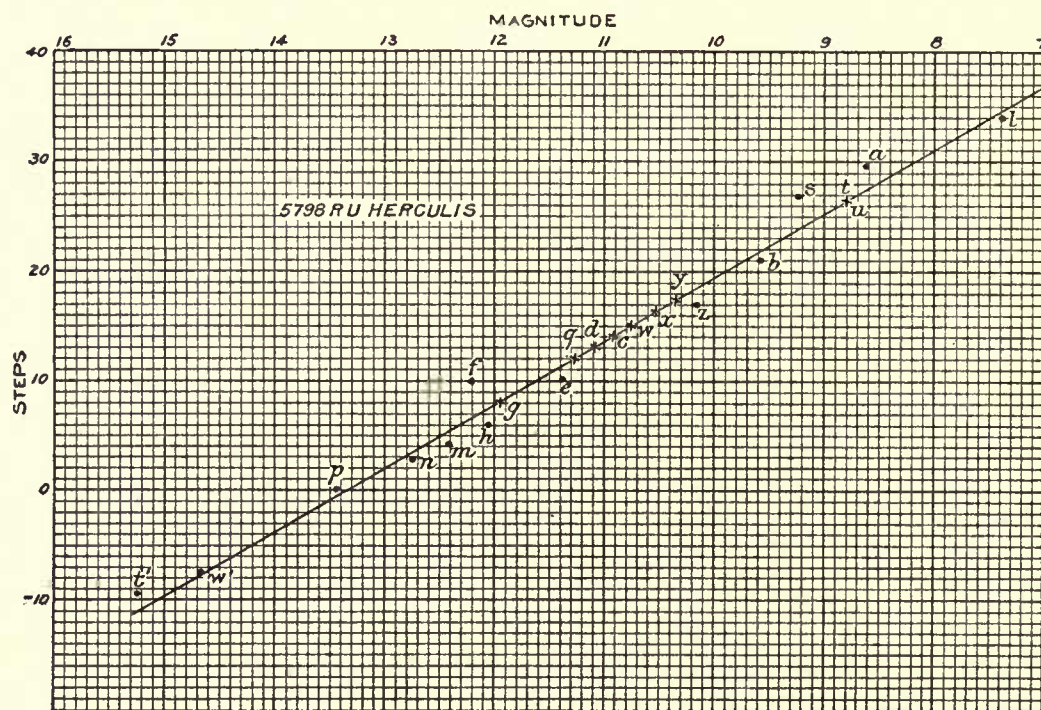


FIG. 16.—MAGNITUDE-CURVE FOR RU HERCULIS.

TABLE 49.—5798 RU HERCULIS VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|-------------|-----------|--|--|--------|-------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1897 Jan. 7 | 18 | 2410000+ 3933.00 | 40 | 6 | a4v, v2b..... | 25.7, 23.0..... | 24.3 | 9.17 | good | 0 | -0.12 |
| 2 | May 5 | 9 | 4050.63 | 150 | 6 | {c1d, d1e, eo-1f, fo-1g.} (g2h, h2-3v.....) | ..... | 3.5 | 12.75 | good | 117 | +0.26 |
| 3 | 17 | .. | 4062 | 150 | 6 | e2f, f2h..... | ..... | <6 | <12 | fair | ... | ... |
| 4 | 25 | .. | 4070 | 150 | 6 | e1-2f, f2h..... | ..... | <6 | <12 | good | ... | ... |
| 5 | June 7 | 9 | 4083.63 | 150 | 6 | e3-4f, f1h..... | ..... | <6 | <12 | good | ... | ... |
| 6 | 20 | 9 | 4096.63 | 40 | 6 | f1h±..... | ..... | <6 | <12 | good | ... | ... |
| 7 | 25 | 9 | 4101.63 | 150 | 6 | e3f, f1h..... | ..... | <6 | <12 | good | ... | ... |
| 8 | July 5 | 9 | 4111.63 | 150 | 6 | e1-2f, f1-2h..... | ..... | <6 | <12 | fair | ... | ... |
| 9 | 17 | 10 | 4123.67 | 80 | 6 | e2f, f1h..... | ..... | <6 | <12 | good | ... | ... |
| 10 | 21 | 9 | 4127.63 | 150 | 6 | {g2m, m2n, n3p.} {p1-2v, limit v.....} | ..... | -1.5 | 13.7 | good | 194 | +0.06 |
| 11 | 23 | 9 | 4129.63 | 80 | 6 | p glimpsed, v not seen | ..... | <0 | <13.3 | good | ... | ... |
| 12 | Aug. 3 | 9 | 4140.63 | 150 | 6 | v not seen, limit p | ..... | <0 | <13.3 | fair | ... | ... |
| 13 | 13 | 9 | 4150.61 | 150 | 6 | v not seen, limit n | ..... | <3 | <12.8 | poor | ... | ... |
| 14 | 14 | 9 | 4151.61 | 150 | 6 | v not seen, limit n | ..... | <3 | <12.8 | fair | ... | ... |
| 15 | 20 | 9 | 4157.61 | 150 | 6 | v not seen, limit p | ..... | <0 | <13.3 | good | ... | ... |
| 16 | Sept. 3 | 8 | 4171.58 | 150 | 6 | v not seen, limit n | ..... | <3 | <12.8 | moon | ... | ... |
| 17 | 12 | 8 | 4180.58 | 150 | 6 | v not seen, limit m or n... | ..... | <3 | <12.8 | moon | ... | ... |
| 18 | 13 | 7 | 4181.54 | 150 | 6 | v not seen, limit 1 < n. | ..... | <2 | <13.0 | fair | ... | ... |
| 19 | 14 | 8 | 4182.56 | 150 | 6 | v not seen, limit p | ..... | <0 | <13.3 | good | ... | ... |
| 20 | 21 | 8 | 4189.56 | 150 | 6 | v suspected, vp? | ..... | <0 | <13.3 | good | ... | ... |
| 21 | 25 | 8 | 4193.56 | ... | 6 | v not seen, limit 3 < n. | ..... | <0 | <13.3 | ... | ... | ... |
| 22 | 29 | 7 | 4197.54 | ... | 6 | v not seen, limit 3 < n. | ..... | <0 | <13.3 | ... | ... | ... |
| 23 | Oct. 14 | 7 | 4212.54 | 150 | 6 | p1v..... | ..... | -1.0 | 13.50 | good | 279 | +0.81 |
| 24 | 23 | 7 | 4221.54 | 150 | 6 | n2-3v, limit v | ..... | 0.3 | 13.28 | good | 288 | +0.88 |
| 25 | 29 | 6 | 4227.50 | 150 | 6 | vn±, m1-2v, limit v..... | 2.8, 2.6..... | 2.7 | 12.89 | ... | 294 | +0.61 |
| 26 | Nov. 11 | 6 | 4240.50 | 150 | 6 | m1v, v1n, g4-5v..... | 3.1, 3.8, 3.5..... | 3.4 | 12.77 | fair | 307 | +0.74 |
| 27 | 16 | 6 | 4245.50 | 150 | 6 | m1v, v1n..... | 3.1, 3.8..... | 3.4 | 12.77 | good | 312 | +0.81 |
| 28 | 1898 Jan. 2 | 18 | 4293.00 | 150 | 6 | m1v, v1n, g5-6v..... | 3.1, 3.8, 2.5..... | 3.1 | 12.80 | good | 360 | +1.50 |
| 29 | 18 | 18 | 4309.00 | 150 | 6 | g3-4v, v1n..... | 4.5, 3.8..... | 4.1 | 12.64 | fair | 376 | +1.53 |
| 30 | 28 | 18 | 4319.00 | { 40 150 | 6 | v3g, d1-2v, q1v..... | 11.0, 11.6, 11.0 } 11.0..... | 11.1 | 11.43 | good | 386 | +0.53 |
| 31 | Feb. 12 | 18 | 4333.98 | 40 | 6 | v3g..... | ..... | 20.0 | 9.92 | good | 401 | -0.18 |
| 32 | Mar. 2 | 17 | 4351.96 | 40 | 6 | v4x, v4d, a6-8v..... | 20.4, 17.1, 22.7.. | 26.2 | 8.87 | good | 418 | +0.12 |
| 33 | 23 | 17 | 4372.96 | 40 | 6 | u3v, v1a, v4-5b, v8-10x.. | {22.5, 28.7, 29.7} {28.4, 25.0.....} | 26.0 | 8.90 | good | 440 | +0.39 |
| 34 | Apr. 1 | 16 | 4381.92 | 40 | 6 | u4v, v2l, va, v1-2s, v4b.... | {27.9, 23.0, 26.7} {26.7, 23.0.....} | 25.4 | 9.00 | good | 449 | +0.50 |
| 35 | 11 | 9 | 4391.63 | 40 | 6 | v1s, v2b, a3v, vt, u3-4v.... | 23.7, 25.7, 21.5, 26.9 | 24.4 | 9.16 | good | 458 | +0.53 |
| 36 | 14 | 9 | 4394.63 | 40 | 6 | {s2v, v2b, b4z, 25d.....} {w2d, 24x, x3a.....} | 24.9, 23.0..... | 23.9 | 9.25 | fair | 462 | +0.52 |
| 37 | 25 | 6 | 4405.61 | 40 | 6 | t6v, b2v, v3y, v5x, v6-8d.. | {20.7, 19.0, 20.5 } {21.4, 20.1.....} | 20.3 | 9.87 | good | 473 | +0.90 |
| 38 | May 7 | 6 | 4417.63 | 40 | 6 | {b5v, v4x, v2-3z.....} {22x, x2-3c, x3-4d.....} | 16.0, 20.4, 19.5.. | 18.6 | 10.16 | good | 1 | +0.83 |
| 39 | 11 | 10 | 4421.65 | 40 | 6 | b5-6v, 20-1v, v1-2x, v4c... | 15.5, 15.5, 17.9, 18.0 | 16.7 | 10.50 | good | 5 | +1.08 |
| 40 | 16 | 9 | 4426.63 | 40 | 6 | b6v, v2, v2x, v3w, x2w.... | 15.0, 17.0, 18.4, 18.0 | 17.1 | 10.41 | fair | 10 | +0.84 |
| 41 | 23 | 9 | 4433.63 | 40 | 6 | v2, v2x, v2-3c..... | 17.0, 18.4, 16.5.. | 17.3 | 10.37 | fair | 17 | +0.64 |
| 42 | June 14 | 9 | 4355.63 | 80 | 12 | v2g, e2v..... | 10.0, 8.1..... | 9.0 | 11.80 | fair | 39 | +1.39 |
| 43 | July 5 | 10 | 4476.67 | 80 | 12 | e3v, v1-2g..... | 7.1, 9.5..... | 8.3 | 11.93 | fair | 60 | +0.72 |
| 44 | 18 | 10 | 4489.67 | 80 | 12 | g2v, v3m..... | 6.0, 7.1..... | 6.5 | 12.25 | poor | 73 | +0.62 |
| 45 | 26 | 10 | 4497.67 | 175 | 12 | g2v, v3-4n..... | 6.0, 6.3..... | 6.1 | 12.30 | fair | 81 | +0.47 |
| 46 | Aug. 8 | 10 | 4510.67 | 175 | 12 | g2-3v, v1n, v6p..... | 5.5, 3.8, 6.0..... | 5.1 | 12.46 | good | 94 | +0.36 |
| 47 | 19 | 9 | 4521.63 | 80 | 12 | g3v, vn v5-6p..... | 5.5, 3.8, 6.0..... | 5.1 | 12.46 | good | 105 | +0.11 |
| 48 | 27 | 9 | 4529.61 | 150 | 6 | n3-4v, limit v, m2v..... | -0.7, 2.1..... | 0.7 | 13.21 | poor | 113 | +0.78 |
| 49 | Sept. 7 | 8 | 4540.58 | 150 | 6 | m2-3v, n2v..... | 1.6, 0.8..... | 1.2 | 13.15 | fair | 124 | +0.65 |
| 50 | Oct. 5 | 7 | 4568.54 | 150 | 6 | n4v, p0-1v..... | -1.2, -0.5..... | -0.8 | 13.47 | fine | 152 | +0.50 |
| 51 | Nov. 1 | 6 | 4595.50 | 150 | 6 | v not seen, limit n..... | ..... | <3 | <12.8 | fair | ... | ... |
| 52 | 2 | 6 | 4596.50 | ... | 6 | v not seen, limit 1-2 < n.. | ..... | <1 | <13.2 | good | ... | ... |

TABLE 49.—5798 RU HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|------|----------------|---------------|---------------------|---------|-----------|--------------------------------------|---------------------------------|--------|--------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1899 | | | | | | | | | | | | |
| 53 | Jan. 8 | 18 | 2410000+ | 200 | 6 | v suspected, limit 2-3 < g. | | < 5.5 | < 12.4 | fair | ... | .... |
| 54 | Jan. 10 | 18 | 4664.00 | 200 | 6 | p1v, n4-5v. | -1.0, -1.7 | -1.3 | 13.58 | good | 250 | +0.05 |
| 55 | Feb. 15 | 17 | 4701.96 | 150 | 6 | f1v, v1g. | 9.0, 9.0 | 9.0 | 11.80 | good | 286 | -0.67 |
| 56 | Mar. 4 | 17 | 4718.96 | 150 | 6 | v4g, c1v, d2v. | 12.0, 13.0, 11.1 | 12.0 | 11.29 | poor | 303 | -0.80 |
| 57 | Mar. 19 | 17 | 4733.96 | 150 | 6 | v1g, d4-5v, c4v, v2f. | 9.0, 8.6, 10.0, 12.0 | 9.9 | 11.67 | good | 318 | -0.20 |
| 58 | Apr. 4 | 15 | 4749.92 | 40 | 6 | v1d, x1-2v. | 14.1, 15.4 | 14.4 | 10.87 | good | 334 | -0.55 |
| 59 | Apr. 16 | 15 | 4761.88 | 40 | 6 | v1-2d, x0-1v, 26-7v. | 14.6, 15.9, 10.5 | 13.7 | 10.99 | fair | 346 | -0.50 |
| 60 | Apr. 28 | 9 | 4773.63 | 40 | 6 | v1d, x4-5v. | 14.0, 11.9 | 12.9 | 11.12 | fair | 358 | -0.20 |
| 61 | May 4 | 9 | 4779.63 | 40 | 6 | v1d, vx, z1-2v. | 14.0, 16.4, 15.5 | 15.3 | 10.73 | good | 364 | -0.56 |
| 62 | May 18 | 9 | 4793.63 | ... | 6 | v4d, v2-3x, z0-1v. | 17.1, 18.9, 16.5 | 17.5 | 10.36 | good | 377 | -0.74 |
| 63 | May 29 | 9 | 4804.63 | 40 | 6 | v5z, b0-1v, s1v. | 22.0, 20.5, 25.9 | 22.8 | 9.44 | good | 388 | -1.44 |
| 64 | June 3 | 9 | 4809.63 | 40 | 6 | u2v, v0-1a, v4b, v3s. | 24.5, 30.2, 25.0, 29.9 | 27.4 | 8.65 | good | 393 | -2.02 |
| 65 | June 13 | 9 | 4819.63 | 40 | 6 | { v3a, v5b, v4s l4-5v, u2-3t. | 32.7, 26.0, 30.9 } 29.9..... | 30.0 | 8.20 | good | 403 | -1.66 |
| 66 | June 19 | 9 | 4825.63 | ... | 6 | l1v, v6a, v5u. | 33.4, 35.7, 31.5 | 33.9 | 7.52 | fair | 409 | -1.82 |
| 67 | June 23 | 9 | 4829.63 | ... | 6 | v2l, v6-8u. | 36.4, 33.5 | 34.9 | 7.36 | good | 413 | -1.64 |
| 68 | July 8 | 9 | 4844.63 | 40 | 6 | l1v, va, v4-5u. | 33.4, 29.7, 31.0 | 31.3 | 7.97 | good | 428 | -0.51 |
| 69 | July 17 | 9 | 4853.63 | 40 | 6 | l3-4v, v2u, v3-4a. | 30.9, 28.0, 33.2 | 30.7 | 8.07 | good | 437 | -0.33 |
| 70 | July 29 | 9 | 4865.61 | 40 | 6 | l7-8v, v1u, v1-2a. | 26.9, 27.5, 31.2 | 28.5 | 8.46 | good | 449 | -0.04 |
| 71 | Aug. 9 | 9 | 4876.61 | 40 | 6 | u2v, va, v8b. | 24.5, 29.7, 24.0 | 26.0 | 8.90 | fair | 460 | +0.21 |
| 72 | Aug. 17 | 9 | 4884.61 | ... | 6 | a2-3v, vs, v1-2b. | 27.2, 26.9, 22.5 | 25.5 | 8.98 | good | 468 | +0.14 |
| 73 | Aug. 26 | 8 | 4893.58 | 40 | 6 | a3v, v1b, v1s. | 26.7, 22.0, 27.9 | 25.5 | 8.98 | good | 477 | -0.11 |
| 74 | Sept. 4 | 8 | 4902.58 | ... | 6 | a5v, b1-2v, v6-7z, v1-2a. | 24.7, 19.5, 23.5, 19.0 | 21.7 | 9.63 | .... | 3 | +0.24 |
| 75 | Sept. 20 | 7 | 4918.54 | 40 | 6 | b4v, v4e, v5x, va. | 17.0, 21.0, 21.4, 17.5 | 19.2 | 10.08 | good | 19 | +0.28 |
| 76 | Oct. 4 | 7 | 4932.54 | 40 | 6 | z1v, v1x, v4d. | 16.0, 17.4, 17.1 | 16.8 | 10.48 | fair | 33 | +0.21 |
| 77 | Oct. 21 | 7 | 4949.54 | 40 | 6 | z4v, vx, v2d. | 13.0, 16.4, 15.1 | 14.8 | 10.63 | fair | 50 | -0.27 |
| 78 | Oct. 28 | 6 | 4956.50 | 40 | 6 | x2v, v0-1d, v very red. | 14.4, 13.6 | 14.0 | 10.77 | fair | 57 | -0.35 |
| 79 | Nov. 6 | 6 | 4965.50 | 40 | 6 | x3v, v1d. | 13.4, 14.1 | 13.0 | 11.10 | fair | 66 | -0.32 |
| 80 | Nov. 22 | 6 | 4981.50 | 150 | 6 | d1v, v4-5g. | 12.1, 12.5 | | | | | |
| 81 | Dec. 14 | 18 | 5004.00 | 150 | 6 | d1-2v, v2g. | 11.6, 10.0 | 10.8 | 11.49 | low | 82 | -0.34 |
| | | | | | | v2-3g. | | 10.5 | 11.53 | fair | 105 | -0.69 |
| 1900 | | | | | | | | | | | | |
| 82 | Jan. 7 | 17 | 5027.98 | 200 | 6 | g1v, vm, v1n. | 7.0, 4.1, 3.8 | 4.6 | 12.57 | good | 129 | +0.02 |
| 83 | Jan. 26 | 15 | 5046.88 | 350 | 40 | { g6v, v2m, v4n pn, u6-8w', w'6t. | 2.0, 6.1, 6.8 | 4.9 | 12.50 | .... | 148 | -0.38 |
| 84 | Feb. 18 | 13 | 5069.79 | 350 | 40 | n3v, v2p. | -0.2, 2.0 | 0.9 | 13.20 | fair | 171 | -0.17 |
| 85 | Feb. 24 | 17 | 5075.96 | 80 | 12 | n3v, p1-2v, limit v. | -0.2, -1.5 | -0.8 | 13.48 | good | 177 | +0.02 |
| 86 | Mar. 7 | 15 | 5086.88 | 275 | 12 | n6v, p1-2v, v4w', limit w'. | -3.2, -1.5, -3.5 | -2.7 | 13.80 | good | 188 | +0.20 |
| 87 | Mar. 21 | 11 | 5100.71 | 275 | 12 | n6v, p2v, limit 2 < v. | -3.2, -2.0 | -2.6 | 13.78 | fair | 202 | +0.05 |
| 88 | Apr. 4 | 15 | 5114.88 | 275 | 12 | n3-4v, p2-3v, v6-8w'. | -0.7, -2.5, -0.5 | -1.2 | 13.55 | good | 216 | -0.25 |
| 89 | Apr. 18 | 12 | 5128.75 | 275 | 12 | n6v, p5v. | -3.2, -5.0 | -4.1 | 14.04 | .... | 230 | +0.27 |
| 90 | May 1 | 10 | 5141.67 | 275 | 12 | n3-4v, v < p. | | -0.7 | 13.47 | poor | 243 | -0.18 |
| 91 | May 24 | 9 | 5164.63 | 275 | 12 | n6v, p1v. | -3.2, -1.0 | -2.1 | 13.71 | good | 266 | +0.63 |
| 92 | June 13 | 9 | 5184.63 | 350 | 40 | m1v, vn, v2p. | 3.1, 2.8, 2.0 | 2.9 | 12.84 | moon | 286 | +0.39 |
| 93 | June 23 | 11 | 5194.71 | 150 | 6 | n1v, limit v. | | 1.8 | 13.01 | fair | 296 | +0.79 |
| 94 | July 21 | 9 | 5222.63 | 150 | 6 | n1v±. | | 1.8 | 13.01 | fair | 324 | +1.22 |
| 95 | July 25 | 10 | 5226.67 | 80 | 12 | n1v, v2p. | 1.8, 2.0 | 1.9 | 13.0 | good | 328 | +1.3± |
| 96 | Aug. 14 | 9 | 5246.63 | 150 | 6 | n1-2v, limit v. | | 1.3 | 13.10 | good | 348 | +1.63 |
| 97 | Sept. 15 | .. | 5278 | 150 | 6 | g4v, vn, m1v, v3p? | 4.0, 2.8, 3.1, 3.0 | 3.2 | 12.79 | good | 379 | +1.69 |
| 98 | Oct. 26 | 7 | 5319.54 | ... | 6 | v5-6x, v5z, s6v, b2-3v. | 21.9, 22.0, 20.9, 18.5 | 20.5 | 9.83 | good | 420 | +1.14 |
| 99 | Nov. 21 | 6 | 5345.50 | ... | .. | b2-3v, v2-3x. | 18.5, 18.9 | 18.7 | 10.13 | poor | 446 | +1.65 |
| 1902 | | | | | | | | | | | | |
| 100 | Mar. 5 | 14 | 5814.83 | 237 | 40 | photometer. |  | .... | < 8.3 | fair | 433 | .... |
| 101 | Mar. 15 | 15 | 5824.88 | 237 | 40 | photometer. |  | .... | 7.75 | fair | 443 | -0.68 |
| 102 | Apr. 30 | .. | 5870 | ... | 6 | photometer. |  | .... | 9.2 | .... | 5 | -0.22 |
| 103 | May 2 | .. | 5872 | 237 | 40 | photometer. |  | .... | 9.02 | .... | 7 | -0.45 |
| 104 | May 6 | .. | 5876 | ... | 6 | photometer. |  | .... | 9.48 | .... | 11 | -0.12 |
| 105 | Oct. 7 | 7 | 6030.54 | 67 | 12 | photometer. | | < 10 | < 11.6 | good | ... | .... |

TABLE 49.—5798 RU HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|---------------------------------|-------------------------|--------|-------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 106 | 1903 May 17 | 9 | 2410000+ 6252.63 | 67 | 12 | v2c± | | 16± | 10.6± | fair | 387 | -0.3± |
| 107 | Oct. 11 | 7 | 6399.54 | 150 | 6 | v4g | | 12.0 | 11.28 | good | 51 | +0.32 |
| 108 | 1904 May 14 | 13 | 6615.79 | 40 | 6 | g1v, v1n..... | 7.0, 3.8 | 5.4 | 12.40 | good | 268 | -0.70 |
| 109 | June 4 | 12 | 6636.74 | ... | 24 | photograph | | ... | 12.3± | ... | ... | ... |
| 110 | 6 | 12 | 6638.76 | ... | 24 | photograph | | ... | 11.9± | ... | ... | ... |
| 111 | 8 | 12 | 6640.74 | ... | 24 | photograph | | ... | 11.37 | good | 292 | -0.93 |
| 112 | July 31 | 8 | 6693.58 | 40 | 6 | photometer | | ... | 11.21 | good | 345 | -0.29 |
| 113 | Aug. 2 | 9 | 6695.63 | 67 | 12 | photometer | | ... | 10.70 | good | 348 | -0.77 |
| 114 | 11 | 9 | 6704.63 | 67 | 12 | photometer | | ... | 10.67 | good | 357 | -0.65 |
| 115 | 13 | 9 | 6706.63 | 67 | 12 | photometer | | ... | 10.76 | good | 359 | -0.49 |
| 116 | 26 | 8 | 6719.58 | 40 | 6 | z2v, v4d | 15.0, 17.1 | 16.0 | 10.60 | moon | 372 | -0.60 |
| 117 | Sept. 2 | 8 | 6726.58 | 67 | 12 | photometer | | ... | 9.75 | good | 379 | -1.33 |
| 118 | 3 | 7 | 6727.54 | 40 | 6 | photometer | | ... | 9.62 | good | 380 | -1.45 |
| 119 | 8 | 8 | 6732.58 | 67 | 12 | photometer | | ... | 9.22 | fair | 385 | -1.73 |
| 120 | 8 | .. | ..... | ... | 24 | photographs | | ... | 9.5± | fair | 385 | ..... |
| 121 | 9 | .. | 6733 | ... | 24 | photographs | } | ... | 9.5 | fair | 386 | -1.85 |
| 122 | 9 | .. | 6733 | 67 | 12 | photometer | | ... | 9.5 | fair | 386 | -1.85 |
| 123 | Oct. 11 | 8 | 6765.58 | 40 | 6 | l4v, v6a | 30.0, 35.7 | 32.8 | 7.72 | good | 418 | -1.04 |
| 124 | 1905 Jan. 12 | 18 | 6859.00 | 40 | 6 | b8v, v2z | 13.0, 19.0 | 17.5 | 10.35 | fair | 28 | +0.27 |
| 125 | Mar. 12 | 13 | 6917.77 | 237 | 40 | v is 1½ to 2¼>g..... |  | ... | ..... | ... | ... | ... |
| 126 | 26 | 13 | 6931.77 | 237 | 40 | g1v, g5-6n | 7.0, 8.3 | 7.4 | 12.08 | fair | ... | ... |
| 127 | Apr. 1 | 12 | 6937.75 | 237 | 40 | g1v, v5n..... | 7.0, 7.8..... | 7.2 | 12.10 | fair | 106 | -0.26 |
| 128 | 22 | 10 | 6958.67 | 237 | 40 | g5v, m1v, v1n | 3.0, 3.1, 3.8 | 3.4 | 12.75 | good | 127 | +0.20 |
| 129 | May 2 | 12 | 6968.75 | 237 | 40 | g3v, v1n..... | 5.0, 2.8 | 3.5 | 12.74 | good | 137 | +0.12 |
| 130 | 20 | 10 | 6986.67 | 237 | 40 | n5v, v1p, v10-12w' | -2.2, 0.0, (3.5) | -0.7 | 13.46 | good | 155 | +0.39 |
| 131 | 31 | 9 | 6997.63 | 200 | 6 | g8v, n5v, p0-1v | 0.0, -2.2, -0.5 | -0.8 | 13.48 | fair | 166 | +0.17 |
| 132 | June 20 | 11 | 7017.71 | 237 | 40 | n4v, p2v, v8-10w' | -1.2, -2.0, (1.5) | -1.6 | 13.60 | good | 186 | 0.00 |
| 133 | 24 | 9 | 7021.63 | 80 | 12 | v not seen, limit m and n | | <3± | <12.8 | poor | ... | ... |
| 134 | 26 | 10 | 7023.67 | 300 | 12 | n5v | | -2.7 | 13.80 | good | 192 | +0.13 |
| 135 | July 4 | 10 | 7031.67 | 237 | 40 | n2-3v, v8w'..... | 0.3, 0.5 | 0.4 | 13.25 | poor | 200 | -0.46 |
| 136 | 23 | 10 | 7050.67 | 237 | 40 | n2-3v, v6-8w'..... | 0.3, -0.5 | -0.1 | 13.37 | good | 219 | -0.42 |
| 137 | Aug. 6 | 9 | 7064.63 | 237 | 40 | n4v, v8w'..... | -1.2, 0.5 | -0.6 | 13.45 | fair | 233 | -0.27 |
| 138 | 19 | 9 | 7077.63 | 237 | 40 | v0-1n, m2v | 3.3, 2.1 | 2.7 | 12.88 | good | 246 | -0.71 |
| 139 | 22 | 8 | 7080.58 | 237 | 40 | n1v, m3v | 1.8, 1.1 | 1.5 | 13.05 | fair | 249 | -0.50 |
| 140 | 28 | 8 | 7086.59 | 150 | 6 | n2v, v near limit | | 0.8 | 13.20 | fair | 255 | -0.23 |
| 141 | Sept. 17 | 7 | 7106.54 | 150 | 6 | g1-2v, v5-6n..... | 6.5, 8.3 | 6.9 | 12.16 | fair | 275 | -0.57 |
| 142 | Oct. 20 | 7 | 7139.54 | 80 | 12 | g5v, m1v, v2n | 3.0, 3.1, 4.8 | 3.8 | 12.69 | good | 308 | +0.66 |
| 143 | 22 | 6 | 7141.50 | 237 | 40 | g3-4v, v2m, v4n | 4.5, 6.1, 6.8 | 5.8 | 12.32 | fair | 310 | +0.32 |

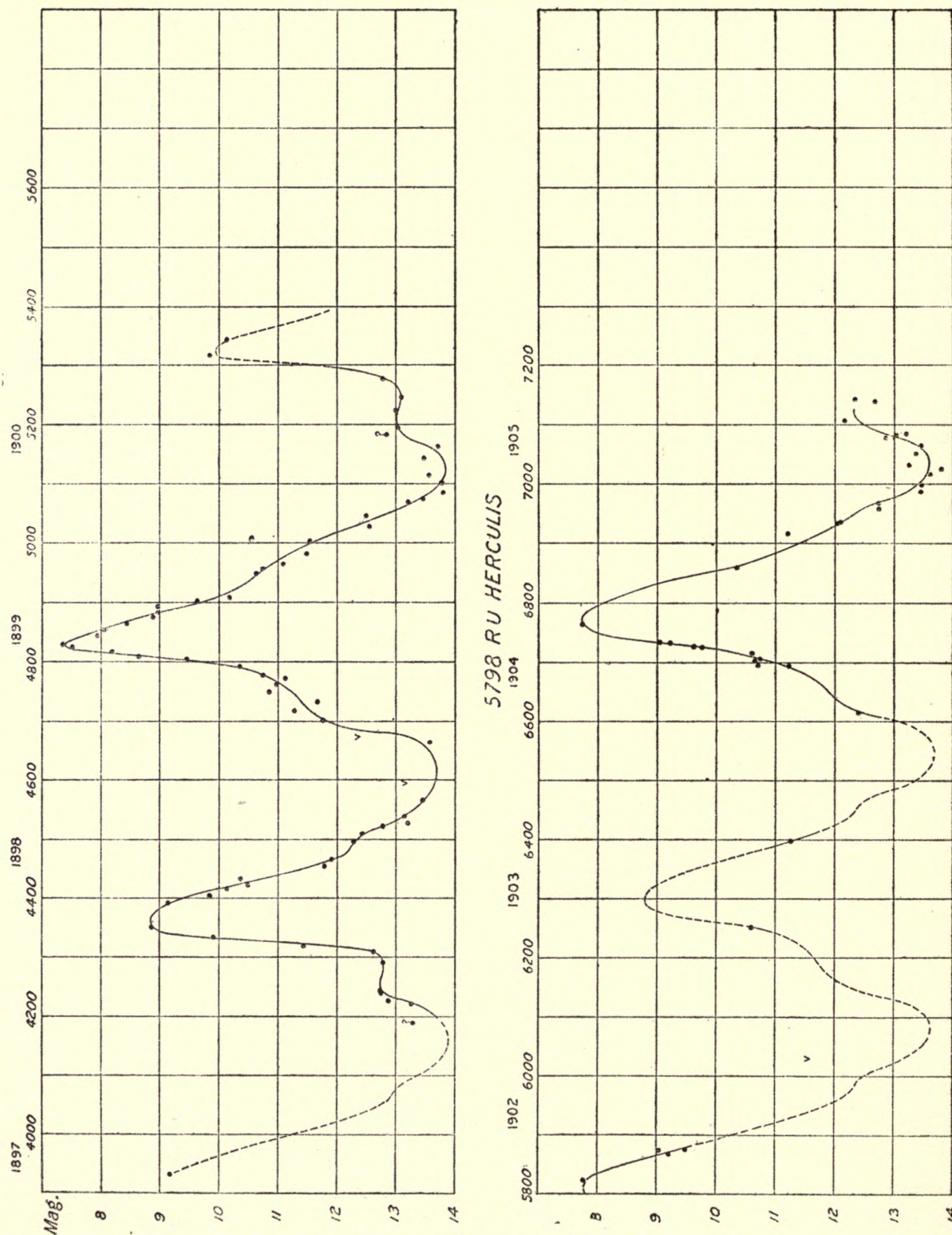


FIG. 17.—LIGHT-CURVE OF RU HERCULIS.

TABLE 50.—5798 RU HERCULIS. MEAN MAGNITUDE FROM 40.25 DAY GROUPS.

| Group No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
|------------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D. | 40 | 80 | 121 | 161 | 201 | 241 | 281 | 322 | 362 | 402 | 442 | 483 | |
| 3933 | <i>t</i> | 0 | .... | 117 | .... | 194 | .... | 279 | 300 | 360 | 388 | 429 | 460 |
| | <i>M</i> | 9.17 | .... | 12.75 | .... | 13.7± | .... | 13.50 | 12.93 | 12.80 | 11.33 | 8.88 | 9.32 |
| | ΔM | -0.12 | .... | +0.26 | .... | +0.06 | .... | +0.81 | +0.76 | +1.50 | +0.63 | +0.26 | -0.61 |
| | No. | 1 | .... | 1 | .... | 1 | .... | 1 | 4 | 1 | 3 | 2 | 4 |
| 4416 | <i>t</i> | 14 | .... | 88 | 138 | .... | .... | 250 | 302 | 346 | 380 | 418 | 464 |
| | <i>M</i> | 10.65 | .... | 12.49 | 13.31 | .... | .... | 13.58 | 11.59 | 10.99 | 9.80 | 7.82 | 8.83 |
| | ΔM | +0.96 | .... | +0.57 | +0.58 | .... | .... | +0.05 | -0.56 | -0.42 | -1.18 | -1.19 | +0.05 |
| | No. | 5 | .... | 6 | 2 | .... | .... | 1 | 3 | 3 | 4 | 5 | 4 |
| 4899 | <i>t</i> | 18 | 58 | 94 | 138 | 179 | 216 | 254 | 291 | 333 | 379 | 420 | 446 |
| | <i>M</i> | 10.28 | 10.83 | 11.51 | 12.54 | 13.49 | 13.79 | 13.59 | 12.92 | 13.04 | 12.79 | 9.83 | 10.13 |
| | ΔM | +0.24 | -0.31 | -0.52 | -0.18 | +0.02 | +0.02 | +0.22 | +0.59 | +1.38 | +1.69 | +1.14 | +1.65 |
| | No. | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 1 |
| 5382 | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 433 | 443 |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 8.3± | 7.75 |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | -0.68 |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1 | 1 |
| 5865 | <i>t</i> | 8 | .... | .... | .... | .... | .... | .... | .... | .... | 387 | .... | .... |
| | <i>M</i> | 9.24 | .... | .... | .... | .... | .... | .... | .... | .... | 10.6± | .... | .... |
| | ΔM | -0.26 | .... | .... | .... | .... | .... | .... | .... | .... | -0.30 | .... | .... |
| | No. | 3 | .... | .... | .... | .... | .... | .... | .... | .... | 1 | .... | .... |
| 6348 | <i>t</i> | .... | 51 | .... | .... | .... | .... | 268 | 292 | 352 | 380 | 418 | .... |
| | <i>M</i> | .... | 11.28 | .... | .... | .... | .... | 12.40 | 11.37 | 10.58 | 9.65 | 7.72 | .... |
| | ΔM | .... | +0.32 | .... | .... | .... | .... | -0.70 | -0.93 | -0.55 | -1.39 | -1.04 | .... |
| | No. | .... | 1 | .... | .... | .... | .... | 1 | 1 | 4 | 5 | 1 | .... |
| 6831 | <i>t</i> | 28 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | 10.35 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | +0.27 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | 1 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Means | <i>t</i> | 14 | 54 | 100 | 138 | 186 | 216 | 263 | 296 | 348 | 381 | 424 | 456 |
| | <i>M</i> | 9.61 | 11.06 | 12.25 | 12.62 | 13.60 | 13.79 | 13.27 | 12.19 | 11.71 | 11.03 | 8.56 | 8.63 |
| | ΔM | +0.21 | 0.00 | +0.10 | +0.20 | +0.04 | +0.02 | +0.10 | +0.04 | +0.48 | -0.11 | -0.21 | +0.41 |
| | No. | 13 | 4 | 9 | 4 | 4 | 3 | 5 | 10 | 11 | 14 | 10 | 10 |

TABLE 51.—5798 RU HERCULIS. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1898 March 6 (J. D. 2414355)+483^d E. $M - m = 217^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|------|-------|-------|-----|---------|--------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 1 | 1898 Mar. 13 | 4362 | 8.85 | 9.12 | + 7 | 13 | 1 | 1897 Aug. 30 | 4167 | 13.90 | 14.17 | + 29 | 10 |
| 2 | 1899 June 23 | 4829 | 7.40 | 7.67 | - 9 | 16 | 2 | 1898 Nov. 9 | 4603 | 13.70 | 13.97 | - 18 | 25 |
| 3 | 1900 Nov. 2 | 5326 | 9.77 | 10.04 | + 5 | 7 | 3 | 1900 Apr. 15 | 5125 | 13.86 | 14.13 | + 21 | 23 |
| 4 | 1902 Mar. 11 | 5820 | .... | mc | + 10 | 2 | 5 | 1902 Nov. 26 | 6080 | .... | mc | + 10 | 1 |
| 5 | 1903 June 28 | 6294 | .... | mc | + 7 | 3 | 6 | 1904 Feb. 28 | 6540 | 13.7 | 14.0 | - 13 | 6 |
| 6 | 1904 Oct. 16 | 6770 | .... | 7.97 | 0 | 12 | | | | | | | |

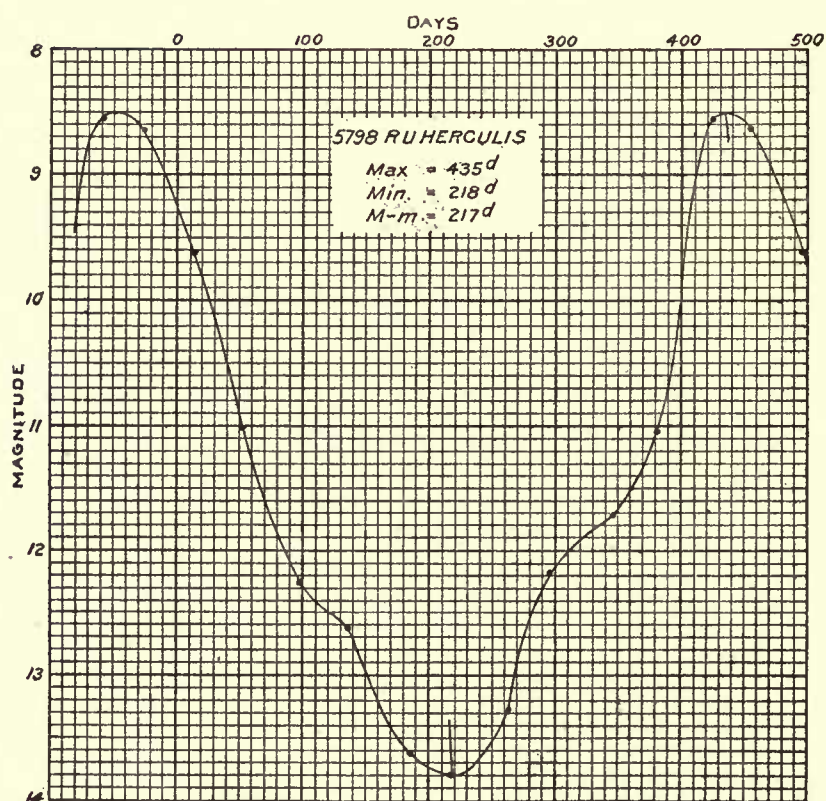


FIG. 18.—MEAN LIGHT-CURVE OF RU HERCULIS.

CHAPTER VII.

6100 RV HERCULIS.

R. A. 16^h 56^m 45^s; Dec. +31° 22' 18" (1900).

This variable was also discovered by Anderson, and observations began immediately after the receipt of the announcement in 1897. It was then rapidly fading and passed below the limit of the 6-inch, October 1, and remained below that limit till 1898 January 18. The following maximum was well fixed as 1898 March 15, at magnitude 10.50 on the Harvard scale. The succeeding minimum was observed with the 12-, 24-, and 40-inch telescopes, the last by the courtesy of Professor Barnard. The four following maxima were well covered by observations, and the minima of epochs 4, 5, and 12; with sufficient comparisons in the intervening time to make sure of the number of the epoch, and to give some idea as to how closely the star was following the mean light-curve.

The positions of the variable and the brighter comparison stars were measured with the 6-inch in August, 1897, the fainter stars (those with the Greek letters, also *k* and *P*) were measured with the 40-inch in June, 1900.

The photometric measures of the stars brighter than the 12th magnitude are more closely accordant than usual, the fainter stars less accordant. The difference between the Harvard and Potsdam systems for the three standard stars used is 0.25, which is just the mean of the magnitude difference for the twelve fields considered.

TABLE 52.—6100 RV HERCULIS. STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|----------|-----------------|--------------------------|----------|-----------------|------------|--------|-----------|------|------------|----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P. DM. | H. | P. | H. | P. | |
| | | | | | | | | | | | |
| <i>B</i> | +29 2924 | <i>h m s</i> 16 58 36 | +29 26.0 | W+ | 7.51 | 7.92 | 7.68 | 7.93 | +17 | +1 | ±4 |
| <i>F</i> | +32 2835 | 16 58 31 | +32 02.0 | WG | 6.34 | 6.62 | 6.37 | 6.62 | +3 | 0 | ±5 |
| <i>G</i> | +31 2967 | 17 04 12 | +31 20.4 | WG— | 6.61 | 6.66 | 6.41 | 6.66 | —20 | 0 | 0 |
| | Means . . . . . | ..... | ..... | ..... | 6.82 | 7.07 | 6.82 | 7.07 | ±13 | 0 | ±3 |

TABLE 53.—COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | | |
|----------|----------|------|--------------|--|----------|--|
| | No. | Mag. | R. A. | | Dec. | |
| | | | <i>h m s</i> | | ° ' | |
| <i>b</i> | +31 2949 | 9.2 | 16 54 49 | | +31 18.6 | |
| <i>e</i> | +31 2951 | 8.6 | 16 55 58 | | +31 26.8 | |

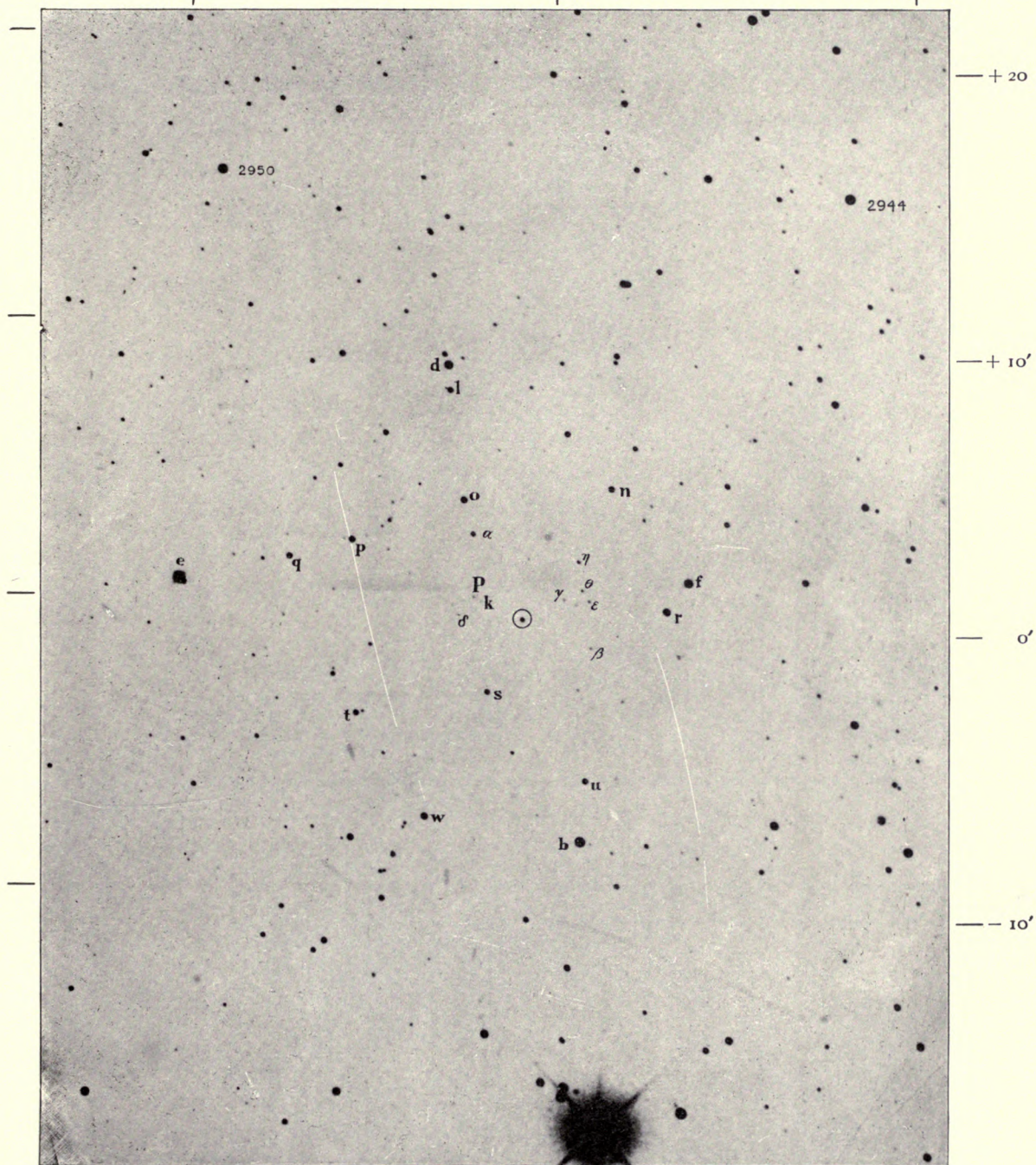
STELLAR PHOTOMETRY.

N
0m

PLATE 7.

+ 1m

- 1m



Scale, 1 mm = 13''.8.

S

1904 July 1.

6100 RV HERCULIS.

R. A. 16^h 56^m 44^s.7. Dec. +31° 22' 18'', 1900.

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California

TABLE 55.—6100 RV HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 September 4. | | | 6-INCH. | | | | Fair, quiet, dull. | |
|-------------------|------------|------------------------|----------------------|----------------------|------------|-------|--------------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 19 26 | 32 | <i>F</i> _{at} | 9.1 10.1 10.1 | 9.77 | 10.80 | 0.37 | 7.05 | 7.30 |
| | | <i>e</i> | 23.9 24.1 24.4 | 24.13 | 25.23 | 2.16 | 8.84 | 9.09 |
| | | <i>d</i> | 44.9 43.4 44.2 | 44.17 | 45.19 | 4.31 | 10.99 | 11.24 |
| | | <i>f</i> | 45.8 46.1 45.1 | 45.67 | 45.32 | 4.32 | 11.00 | 11.25 |
| | 34 | <i>b</i> | 32.5 31.6 31.4 | 31.83 | 31.88 | 2.91 | 9.59 | 9.84 |
| | 35 | <i>B</i> | 15.9 16.1 15.1 | 15.70 | 15.89 | 1.07 | 7.75 | 8.00 |
| | 33 | <i>G</i> _{at} | 11.7 11.9 11.6 | 11.73 | 11.78 | 0.48 | 7.16 | 7.41 |
| | | <i>G</i> _{at} | 12.1 11.2 12.2 | 11.83 | ..... | ..... | ..... | ..... |
| | 36 | <i>B</i> | 16.3 15.9 16.0 | 16.07 | ..... | ..... | ..... | ..... |
| | 35 | <i>b</i> | 32.1 31.5 32.2 | 31.93 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 45.4 44.3 45.2 | 44.97 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 46.1 46.2 46.3 | 46.20 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 26.2 26.7 26.1 | 26.33 | ..... | ..... | ..... | ..... |
| 19 45 | 36 | <i>F</i> _{at} | 11.7 11.9 11.9 | 11.83 | ..... | ..... | ..... | ..... |
| 1904 September 5. | | | Good, somewhat dull. | | | | | |
| 18 40 | 24 | <i>F</i> _{at} | 9.2 9.7 9.0 | 9.30 | 9.79 | 0.28 | 7.18 | 7.43 |
| | | <i>e</i> | 22.0 22.3 22.9 | 22.40 | 22.29 | 1.86 | 8.76 | 9.01 |
| | | <i>d</i> | 40.9 41.3 41.5 | 41.23 | 40.85 | 3.93 | 10.83 | 11.08 |
| | | <i>f</i> | 43.1 43.2 42.5 | 42.93 | 42.83 | 4.11 | 11.01 | 11.26 |
| | 26 | <i>b</i> | 29.7 29.9 29.8 | 29.80 | 29.30 | 2.62 | 9.52 | 9.77 |
| | 27 | <i>B</i> | 13.3 14.0 13.9 | 13.73 | 13.57 | 0.73 | 7.63 | 7.88 |
| | 27 | <i>G</i> _{at} | 9.3 9.9 9.3 | 9.50 | 9.75 | 0.26 | 7.16 | 7.41 |
| | | <i>G</i> _{at} | 10.0 9.8 10.2 | 10.00 | ..... | ..... | ..... | ..... |
| | 28 | <i>B</i> | 13.5 13.3 13.4 | 13.40 | ..... | ..... | ..... | ..... |
| | 28 | <i>b</i> | 29.0 28.6 28.8 | 28.80 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 42.3 43.0 42.9 | 42.73 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 39.8 40.7 40.9 | 40.47 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 21.9 22.4 22.2 | 22.17 | ..... | ..... | ..... | ..... |
| 19 1 | 28 | <i>F</i> _{at} | 10.5 10.2 10.1 | 10.27 | ..... | ..... | ..... | ..... |
| 1904 August 11. | | | 12-INCH. | | | | Good. | |
| 18 42 | 23 | <i>b</i> | 27.5 27.5 26.6 | 27.20 | 27.99 | 2.45 | 9.85 | 10.09 |
| | | <i>u</i> | 52.4 51.5 52.5 | 52.13 | 51.67 | 4.96 | 12.36 | 12.60 |
| | | <i>r</i> | 43.2 44.3 43.7 | 43.73 | 44.31 | 4.25 | 11.65 | 11.89 |
| | | <i>f</i> | 36.7 37.1 37.2 | 37.00 | 37.64 | 3.50 | 10.90 | 11.14 |
| | | <i>s</i> | 55.9 57.0 56.4 | 56.43 | 56.95 | 5.35 | 12.75 | 12.99 |
| | | <i>o</i> | 41.9 42.2 43.0 | 42.37 | 42.75 | 4.07 | 11.47 | 11.71 |
| | | <i>d</i> | 35.9 36.7 36.1 | 36.23 | 36.03 | 3.31 | 10.71 | 10.95 |
| 18 53 | 25 | <i>e</i> | 18.2 17.6 17.4 | 17.73 | 17.83 | 1.43 | 8.83 | 9.07 |
| 19 7 | 28 | <i>e</i> | 18.2 18.1 17.5 | 17.93 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 35.9 35.9 35.7 | 35.83 | ..... | ..... | ..... | ..... |
| | | <i>o</i> | 42.9 43.3 43.2 | 43.13 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 57.5 57.7 57.2 | 57.47 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 37.7 38.9 38.2 | 38.27 | ..... | ..... | ..... | ..... |
| | | <i>r</i> | 44.0 45.5 44.9 | 44.80 | ..... | ..... | ..... | ..... |
| | | <i>u</i> | 51.3 51.2 51.1 | 51.20 | ..... | ..... | ..... | ..... |
| 19 18 | 29 | <i>b</i> | 29.3 28.2 28.8 | 28.77 | ..... | ..... | ..... | ..... |

TABLE 55.—6100 RV HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 August 13. | | | 12-INCH. | | | | Good. | |
|-------------------|------------|----------|----------------------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 19 38 | 33 | <i>b</i> | 31.3 32.5 32.4 | 32.07 | 32.60 | 2.93 | 9.95 | 10.19 |
| | | <i>u</i> | 56.7 56.1 55.9 | 56.23 | 56.72 | 5.33 | 12.35 | 12.59 |
| | | <i>r</i> | 49.0 48.4 49.7 | 49.03 | 48.53 | 4.67 | 11.69 | 11.93 |
| | | <i>f</i> | 42.5 41.6 42.2 | 42.10 | 41.22 | 3.91 | 10.93 | 11.17 |
| | | <i>s</i> | 60.1 59.0 58.7 | 59.27 | 59.15 | 5.45 | 12.47 | 12.71 |
| | | <i>o</i> | 45.8 46.5 48.0 | 46.77 | 46.00 | 4.42 | 11.44 | 11.68 |
| | | <i>d</i> | 40.0 40.1 39.6 | 39.90 | 38.94 | 3.65 | 10.67 | 10.91 |
| | | <i>e</i> | 20.1 20.3 19.2 | 19.87 | 20.07 | 1.72 | 8.74 | 8.98 |
| | | <i>e</i> | 20.4 19.8 20.6 | 20.27 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 37.1 38.3 38.5 | 37.97 | ..... | ..... | ..... | ..... |
| | | <i>o</i> | 44.8 45.9 45.0 | 45.23 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 57.6 59.2 60.3 | 59.03 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 39.9 40.9 40.2 | 40.33 | ..... | ..... | ..... | ..... |
| | | <i>r</i> | 47.0 48.9 48.2 | 48.03 | ..... | ..... | ..... | ..... |
| | | <i>u</i> | 57.8 56.8 57.0 | 57.20 | ..... | ..... | ..... | ..... |
| 19 58 | 37 | <i>b</i> | 33.0 32.8 33.6 | 33.13 | ..... | ..... | ..... | ..... |
| 1904 September 8. | | | Quiet, dull, fair to good. | | | | | |
| 20 35 | 44 | <i>b</i> | 20.1 20.9 20.7 | 20.57 | 21.60 | 1.88 | 9.88 | 10.12 |
| | | <i>u</i> | 41.9 42.6 41.8 | 42.10 | 43.24 | 4.13 | 12.13 | 12.37 |
| | | <i>r</i> | 38.6 39.2 38.4 | 38.73 | 39.13 | 3.68 | 11.68 | 11.92 |
| | | <i>f</i> | 29.8 30.7 30.2 | 30.23 | 31.07 | 2.76 | 10.76 | 11.00 |
| | | <i>s</i> | 48.3 48.1 48.2 | 48.20 | 49.29 | 4.78 | 12.78 | 13.02 |
| | | <i>o</i> | 37.3 37.2 38.0 | 37.50 | 37.32 | 3.46 | 11.46 | 11.70 |
| | | <i>d</i> | 29.7 29.4 29.8 | 29.63 | 29.80 | 2.63 | 10.63 | 10.87 |
| | | <i>e</i> | 14.0 14.7 15.0 | 14.57 | 14.72 | 1.01 | 9.01 | 9.25 |
| | | <i>e</i> | 15.2 14.4 15.0 | 14.87 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 30.5 29.2 30.2 | 29.97 | ..... | ..... | ..... | ..... |
| | | <i>o</i> | 36.2 37.3 38.0 | 37.17 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 51.1 50.2 49.8 | 50.37 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 30.8 32.8 32.1 | 31.90 | ..... | ..... | ..... | ..... |
| | | <i>r</i> | 38.5 40.6 39.5 | 39.53 | ..... | ..... | ..... | ..... |
| | | <i>u</i> | 45.0 44.1 44.0 | 44.37 | ..... | ..... | ..... | ..... |
| 21 0 | | <i>b</i> | 22.9 22.9 22.1 | 22.63 | ..... | ..... | ..... | ..... |
| 1900 June 8. | | | 40-INCH, WEDGE II. | | | | | |
| 12 45 | | <i>P</i> | 50.9 46.8 47.2 48.1 | 48.25 | ..... | 4.82 | 14.87 | 15.12 |
| | | <i>s</i> | 28.1 28.1 26.2 29.5 | 27.98 | ..... | 2.62 | 12.67 | 12.92 |
| | | <i>β</i> | 47.1 44.3 46.5 44.6 | 45.63 | ..... | 4.57 | 14.62 | 14.87 |
| | | <i>η</i> | 40.9 41.7 40.0 42.3 | 41.23 | ..... | 4.07 | 14.12 | 14.37 |
| 13 15 | | <i>r</i> | 21.0 20.2 20.8 21.5 | 20.88 | ..... | 1.63 | 11.68 | 11.93 |
| 1900 July 12. | | | | | | | | |
| | | <i>s</i> | 27.0 24.0 26.0 29.3 | 26.58 | ..... | 2.45 | 12.52 | 12.77 |
| | | <i>v</i> | 24.4 24.1 23.9 25.0 | 24.35 | ..... | 2.14 | 12.21 | 12.46 |
| | | <i>η</i> | 44.0 43.9 41.8 43.7 | 43.35 | ..... | 4.32 | 14.39 | 14.64 |
| | | <i>f</i> | 12.5 13.8 15.2 14.1 | 13.90 | ..... | 0.52 | 10.59 | 10.84 |
| | | <i>r</i> | 22.4 21.1 21.7 20.9 | 21.53 | ..... | 1.74 | 11.81 | 12.06 |
| | | <i>α</i> | 32.2 32.0 32.2 34.2 | 32.65 | ..... | 3.15 | 13.22 | 13.47 |
| 18 45 | | <i>o</i> | 20.4 20.8 22.8 20.0 | 21.00 | ..... | 1.67 | 11.74 | 11.99 |

TABLE 55.—6100 RV HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1900 August 30. | | 40-INCH, WEDGE II. | | | | | | |
|--------------------|------------|-------------------------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | | <i>f</i> | 8.0 14.2 13.2 | 11.80 | 13.30 | 0.45 | 10.64 | 10.89 |
| 19 6 | | <i>r</i> | 23.4 22.5 23.0 | 22.97 | 21.12 | 1.70 | 11.89 | 12.14 |
| | | <i>s</i> | 26.5 27.5 26.3 | 26.77 | 26.62 | 2.47 | 12.66 | 12.91 |
| | | <i>δ</i> | 55.5 54.4 53.5 | 54.47 | 53.65 | 5.23 | 15.42 | 15.67 |
| | | <i>P</i> | 51.3 50.9 50.7 | 50.97 | 50.45 | 5.02 | 15.21 | 15.46 |
| | | <i>k</i> | 57.3 57.8 59.1 | 58.07 | 56.57 | 5.45 | 15.64 | 15.89 |
| | | <i>β</i> | 45.8 48.2 48.0 | 47.33 | 47.22 | 4.73 | 14.92 | 15.17 |
| | | <i>η</i> | 45.0 44.8 44.2 | 44.67 | 43.59 | 4.35 | 14.54 | 14.79 |
| | | <i>θ</i> | 53.8 53.2 50.9 | 52.63 | ..... | 5.17 | 15.36 | 15.61 |
| | | <i>η</i> | 41.8 43.5 42.2 | 42.50 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 46.1 48.2 47.0 | 47.10 | ..... | ..... | ..... | ..... |
| | | <i>k</i> | 53.1 55.2 56.9 | 55.07 | ..... | ..... | ..... | ..... |
| | | <i>P</i> | 50.8 48.8 50.2 | 49.93 | ..... | ..... | ..... | ..... |
| | | <i>δ</i> | 52.6 52.9 53.0 | 52.83 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 27.3 26.5 25.6 | 26.47 | ..... | ..... | ..... | ..... |
| 19 46 | | <i>r</i> | 18.1 18.6 21.0 | 19.27 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 12.9 16.5 15.0 | 14.80 | ..... | ..... | ..... | ..... |
| 1900 September 13. | | Air quiet, seeing good. | | | | | | |
| 19 6 | | <i>u</i> | 23.8 24.4 22.0 | 23.40 | 24.57 | 2.18 | 12.15 | 12.40 |
| | | <i>s</i> | 26.2 27.1 27.3 | 26.87 | 28.07 | 2.64 | 12.61 | 12.86 |
| | | <i>f</i> | 15.8 16.8 16.8 | 16.47 | 17.02 | 1.03 | 11.00 | 11.25 |
| | | <i>r</i> | 20.8 21.5 22.2 | 21.50 | 22.17 | 1.83 | 11.80 | 12.05 |
| | | <i>β</i> | 46.1 46.2 47.1 | 46.47 | 47.49 | 4.75 | 14.72 | 14.97 |
| | | <i>e</i> | 48.2 | 48.2 | ..... | 4.8± | 14.8± | 15.0± |
| | | <i>θ</i> | 49.2 | 49.2 | ..... | 4.9± | 14.9± | 15.1± |
| | | <i>η</i> | 40.5 41.5 39.5 | 40.50 | 40.50 | 4.00 | 13.97 | 14.22 |
| | | <i>α</i> | 31.0 32.2 33.2 | 32.13 | 32.01 | 3.10 | 13.07 | 13.32 |
| | | <i>o</i> | 20.0 18.8 20.0 | 19.60 | 19.51 | 1.43 | 11.40 | 11.65 |
| | | <i>δ</i> | 48.5 51.9 53.2 | 50.90 | 50.75 | 5.04 | 15.01 | 15.26 |
| | | <i>P</i> | 46.8 46.2 47.5 | 46.83 | 47.93 | 4.80 | 14.77 | 15.02 |
| | | <i>k</i> | 54.9 57.0 55.1 | 55.67 | ..... | 5.40 | 15.37 | 15.62 |
| | | <i>P</i> | 48.9 49.9 48.3 | 49.03 | ..... | ..... | ..... | ..... |
| | | <i>δ</i> | 50.2 50.4 51.2 | 50.60 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 45.9 46.0 48.8 | 46.90 | ..... | 4.70 | 14.67 | 14.92 |
| | | <i>o</i> | 20.1 18.2 20.0 | 19.43 | ..... | ..... | ..... | ..... |
| | | <i>α</i> | 31.9 31.5 32.3 | 31.90 | ..... | ..... | ..... | ..... |
| 19 45 | | <i>η</i> | 40.2 40.3 41.0 | 40.50 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 48.1 48.9 48.5 | 48.50 | ..... | ..... | ..... | ..... |
| | | <i>r</i> | 21.5 23.9 23.1 | 22.83 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 18.9 17.6 16.2 | 17.57 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 30.0 28.8 29.0 | 29.27 | ..... | ..... | ..... | ..... |
| | | <i>u</i> | 25.5 26.5 25.2 | 25.73 | ..... | ..... | ..... | ..... |

TABLE 56.—6100 RV HERCULIS. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|---------|---------------|-----------|------|---------------|-----------|-------------------|-----------|------|---------------|-----------|-------------------|-----------|------|---------------|-----------|
| Star. | 1904 July 31. | | | | | 1904 September 4. | | | | | 1904 September 5. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| B..... | 0.80 | 7.67 | 7.92 | + .16 | .00 | 1.07 | 7.75 | 8.00 | + .24 | + .08 | 0.73 | 7.63 | 7.88 | + .12 | -.04 |
| F..... | -0.48 | 6.39 | 6.64 | + .05 | + .02 | -0.38 | 6.30 | 6.55 | -.04 | -.07 | -0.47 | 6.43 | 6.68 | + .09 | + .06 |
| G..... | -0.46 | 6.41 | 6.66 | -.20 | .00 | -0.27 | 6.41 | 6.66 | -.20 | .00 | -0.49 | 6.41 | 6.66 | -.20 | .00 |
| Means. | -0.05 | 6.82 | 7.07 | \pm .14 | \pm .01 | 0.14 | 6.82 | 7.07 | \pm .16 | \pm .05 | -0.08 | 6.82 | 7.07 | \pm .14 | \pm .03 |
| M..... | ..... | 6.87 | 7.12 | ... | ... | ..... | 6.68 | 6.93 | ... | ... | ..... | 6.90 | 7.15 | ... | ... |

| 12-INCH. | | | | | 40-INCH. | | | | | |
|---------------|-----------------|----------|----------|----------|-----------|------------------|---------|----------|----------|-----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | | |
| | | Aug. 11. | Aug. 13. | Sept. 8. | | | June 8. | July 12. | Aug. 30. | Sept. 13. |
| b..... | 9.62 | 2.45 | 2.93 | 1.88 | f..... | 10.86 | .... | 0.52 | 0.45 | 1.03 |
| d..... | 10.87 | 3.31 | 3.65 | 2.63 | o..... | 11.46 | .... | 1.67 | .... | .... |
| e..... | 8.77 | 1.43 | 1.72 | 1.01 | r..... | 11.67 | 1.63 | 1.74 | 1.70 | 1.83 |
| f..... | 11.01 | 3.50 | 3.91 | 2.76 | s..... | 12.67 | 2.62 | 2.45 | 2.47 | 2.64 |
| | | | | | u..... | 12.28 | .... | .... | .... | 2.18 |
| Mean C..... | ..... | 2.67 | 3.05 | 2.07 | Mean C .. | ..... | 2.12 | 1.60 | 1.54 | 1.92 |
| Mean Mag. ... | 10.07 | 10.07 | 10.07 | 10.07 | Mean Mag | ..... | 12.17 | 11.67 | 11.73 | 11.87 |
| M..... | ..... | 7.40 | 7.02 | 8.00 | M..... | ..... | 10.05 | 10.07 | 10.19 | 9.95 |

TABLE 57.—6100 RV HERCULIS. MEAN MAGNITUDES OF COMPARISON STARS.

| 6 INCH. | | | | | | | | | |
|----------------|----------|---------------|----------|---------------|----------|---------------|---------|---------|---------------|
| Star. | July 31. | | Sept. 4. | | Sept. 5. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>B</i> | 7.67 | -0.01 | 7.75 | +0.07 | 7.63 | -0.05 | 7.68 | 7.93 | ± 0.04 |
| <i>F</i> | 6.39 | +0.02 | 6.30 | -0.07 | 6.43 | +0.06 | 6.37 | 6.62 | ± 0.05 |
| <i>G</i> | 6.41 | 0.00 | 6.41 | 0.00 | 6.41 | 0.00 | 6.41 | 6.66 | 0.00 |
| Mean | | | | | | | 6.82 | 7.07 | ± 0.03 |
| <i>b</i> | 9.76 | +0.14 | 9.59 | -0.03 | 9.52 | -0.10 | 9.62 | 9.87 | ± 0.09 |
| <i>d</i> | 10.78 | -0.09 | 10.99 | +0.12 | 10.83 | -0.04 | 10.87 | 11.12 | ± 0.08 |
| <i>e</i> | 8.72 | -0.05 | 8.84 | +0.07 | 8.76 | -0.01 | 8.77 | 9.02 | ± 0.04 |
| <i>f</i> | 11.01 | 0.00 | 11.00 | -0.01 | 11.01 | 0.00 | 11.01 | 11.26 | 0.00 |
| Mean | | | | | | | 10.07 | 10.32 | ± 0.05 |

| 12-INCH. | | | | | | | | | |
|----------------|----------|---------------|----------|---------------|----------|---------------|---------|---------|---------------|
| Star. | Aug. 11. | | Aug. 13. | | Sept. 8. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>b</i> | 9.85 | -0.04 | 9.95 | +0.06 | 9.88 | -0.01 | 9.89 | 10.14 | ± 0.04 |
| <i>d</i> | 10.71 | +0.04 | 10.67 | 0.00 | 10.63 | -0.04 | 10.67 | 10.92 | ± 0.03 |
| <i>e</i> | 8.83 | -0.03 | 8.74 | -0.12 | 9.01 | +0.15 | 8.86 | 9.11 | ± 0.10 |
| <i>f</i> | 10.90 | +0.04 | 10.93 | +0.07 | 10.76 | -0.10 | 10.86 | 11.11 | ± 0.07 |
| Mean | | | | | | | 10.07 | 10.32 | ± 0.06 |
| <i>o</i> | 11.47 | +0.01 | 11.44 | -0.02 | 11.46 | 0.00 | 11.46 | 11.71 | ± 0.01 |
| <i>r</i> | 11.65 | -0.02 | 11.69 | +0.02 | 11.68 | +0.01 | 11.67 | 11.92 | ± 0.02 |
| <i>s</i> | 12.75 | +0.08 | 12.47 | -0.20 | 12.78 | +0.11 | 12.67 | 12.92 | ± 0.13 |
| <i>u</i> | 12.36 | +0.08 | 12.35 | +0.07 | 12.13 | -0.15 | 12.28 | 12.53 | ± 0.10 |
| Mean | | | | | | | 12.02 | 12.27 | ± 0.06 |

| 40-INCH. | | | | | | | | | | | |
|------------------|---------|---------------|----------|---------------|----------|---------------|------------|---------------|------------|------------|---------------|
| Star. | June 8. | | July 12. | | Aug. 30. | | Sept. 13. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>f</i> | | | 10.59 | -0.15 | 10.64 | -0.10 | 11.00 | +0.25 | 10.74 | 10.99 | ± 0.17 |
| <i>o</i> | | | 11.74 | +0.17 | | | 11.40 | -0.17 | 11.57 | 11.82 | ± 0.17 |
| <i>r</i> | 11.68 | -0.12 | 11.81 | +0.01 | 11.89 | +0.09 | 11.80 | 0.00 | 11.80 | 12.05 | ± 0.05 |
| <i>s</i> | 12.67 | -0.15 | 12.52 | 0.00 | 12.66 | +0.04 | 12.61 | -0.09 | 12.62 | 12.87 | ± 0.05 |
| Mean | | | | | | | | | 11.66 | 11.91 | 0.11 |
| <i>k</i> | | | | | 15.64 | +0.14 | 15.37 | -0.13 | 15.50 | 15.75 | ± 0.14 |
| <i>P</i> | 14.87 | -0.08 | | | 15.21 | +0.26 | 14.77 | -0.18 | 14.95 | 15.20 | ± 0.17 |
| <i>a</i> | | | 13.22 | +0.08 | | | 13.07 | -0.07 | 13.14 | 13.39 | ± 0.08 |
| β | 14.62 | -0.13 | | | 14.92 | +0.17 | 14.72 | -0.03 | 14.75 | 15.00 | ± 0.10 |
| δ | | | | | 15.42 | +0.20 | 15.01 | -0.21 | 15.22 | 15.47 | ± 0.21 |
| ϵ | | | | | | | 14.8 | | 14.8 \pm | 15.1 \pm | |
| η | 14.12 | -0.14 | 14.39 | +0.13 | 14.54 | +0.28 | 13.97 | -0.29 | 14.26 | 14.51 | ± 0.21 |
| θ | | | | | 15.36 | | 14.9 \pm | | 15.21 | 15.46 | |
| Mean | | | | | | | | | | | ± 0.15 |

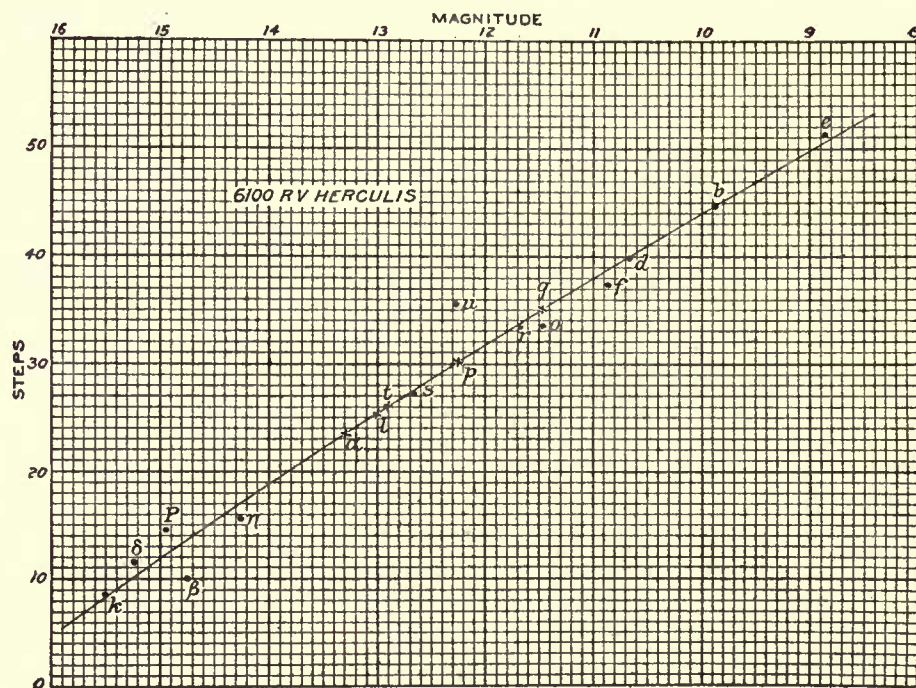


FIG. 19.—MAGNITUDE-CURVE FOR RV HERCULIS.

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|---|-----------------------------|--------|-------|--------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1897 Aug. 23 | 9 | 2410000+ 4160.63 | 80 | 6 | <i>vid</i> , <i>b2-3v</i> | 40.8, 42.1..... | 41.4 | 10.40 | poor | 0 | -0.13 |
| 2 | 24 | 9 | 4161.63 | 150 | 6 | <i>b3v</i> , <i>v1-2d</i> | 41.6, 41.3..... | 40.4 | 10.57 | good | 1 | +0.01 |
| | | | | 80 | 6 | <i>vfj</i> , <i>b4v</i> , <i>vo-1d</i> | 40.6, 40.3, 38.2..... | | | | | |
| | | | | 80 | 6 | <i>vid</i> , <i>v2f</i> , <i>f40</i> , <i>o2p</i> | 38.7, 41.6..... | | | | | |
| | | | | 80 | 6 | <i>pw</i> , <i>px</i> , <i>q1u</i>..... | ..... |  |  |  |  |  |
| | | | | 80 | 6 | <i>u2s</i> , <i>st</i> , <i>qr</i> , <i>r2m</i>..... | ..... |  |  |  |  |  |
| 3 | 27 | 9 | 4164.63 | 150 | 6 | <i>mn</i> , <i>s2l</i> , limit <i>l</i>..... | ..... | 39.5 | 10.75 | good | 4 | +0.18 |
| | | | | 150 | 6 | <i>b4v</i> , <i>d1v</i> , <i>v2f</i> | 40.6, 38.8, 39.2..... | | | | | |
| | | | | 150 | 6 | <i>b5v</i> , <i>d2v</i> , <i>v40</i> , <i>v2f</i> | 39.6, 37.8, 37.4, 39.2..... | | | | | |
| | | | | 80 | 6 | <i>d2v</i> , <i>v2f</i> , <i>v2-30</i> | 37.8, 39.2, 35.9..... | | | | | |
| | | | | 150 | 6 | <i>d2v</i> , <i>vo-1f</i> , <i>v30</i> | 37.8, 37.7, 36.4..... | | | | | |
| 4 | 29 | 8 | 4166.58 | 150 | 6 | <i>d4v</i> , <i>f2v</i> , <i>v30</i> | 35.8, 35.2, 36.4..... | 37.3 | 11.06 | good | 7 | +0.46 |
| 5 | 30 | 9 | 4167.63 | 150 | 6 | <i>f4v</i> , <i>vo-10</i> , <i>v4p</i> | 33.2, 33.9, 34.3..... | 36.4 | 11.25 | moon | 11 | +0.43 |
| 6 | Sept. 3 | 8 | 4171.58 | 150 | 6 | <i>r2v</i> , <i>o3v</i> , <i>v1p</i> | 31.3, 30.4, 31.3..... | 33.8 | 11.69 | moon | 15 | +0.43 |
| 7 | 7 | 8 | 4175.58 | 150 | 6 | <i>r6v</i> , <i>o4v</i> , <i>p1u</i> | 27.3, 29.4, 29.3..... | 31.0 | 12.10 | fine | 20 | +0.88 |
| 8 | 12 | 8 | 4180.58 | 150 | 6 | <i>v1-2s</i> , <i>o2t</i> , limit <i>2</i> < <i>t</i> | 28.8..... | 25.6 | 12.98 | fine | 25 | +1.19 |
| 9 | 17 | 7 | 4185.54 | 150 | 6 | <i>p2v</i> , <i>v2s</i> , limit <i>3-4</i> < <i>s</i> | 28.3, 29.3..... | 28.7 | 12.50 | good | 29 | +1.50 |
| 10 | 21 | 7 | 4189.54 | 150 | 6 | <i>o6v</i> , <i>p4v</i> , <i>vs</i> , <i>v2t</i> | 27.4, 26.3, 27.3..... | 27.0 | 12.49 | good | 30 | +1.47 |
| 11 | 22 | 7 | 4190.54 | 150 | 6 | <i>s1-2v</i> , limit <i>v</i>..... | ..... | 25.8 | 12.77 | good | 33 | +1.67 |
| 12 | 25 | 8 | 4193.56 | 150 | 6 | <i>s2v</i> , <i>vt</i> | 25.3, 26.0..... | 25.8 | 12.96 | good | 36 | +1.78 |
| 13 | 28 | 8 | 4196.58 | 150 | 6 | <i>v</i> not seen, limit <i>u</i>..... | ..... | 25.6 | 12.98 | good | 39 | +1.71 |
| 14 | Oct. 1 | 8 | 4199.58 | 150 | 6 | <i>v</i> not seen, limit <i>3</i> < <i>s</i>..... | ..... | <36 | <12.3 | good | ... | ... |
| 15 | 13 | 7 | 4211.54 | 150 | 6 | <i>v</i> not seen, limit <i>1</i> < <i>s</i>..... | ..... | <24 | <13.2 | good | ... | ... |
| 16 | 14 | 7 | 4212.54 | 150 | 6 | <i>v</i> not seen, limit <i>2</i> < <i>s</i>..... | ..... | <26 | <12.9 | good | ... | ... |
| 17 | 25 | 6 | 4223.50 | 150 | 6 | <i>v</i> not seen, limit <i>s</i>..... | ..... | <25 | <13.1 | good | ... | ... |
| 18 | 29 | 6 | 4227.50 | 150 | 6 | <i>v</i> not seen, limit <i>1</i> < <i>s</i>..... | ..... | <27 | <12.8 | good | ... | ... |
| 19 | Nov. 11 | 6 | 4240.50 | 150 | 6 | <i>v</i> not seen, limit <i>u</i>..... | ..... | <26 | <12.9 | fine | ... | ... |
| 20 | 16 | 6 | 4245.50 | 150 | 6 | <i>v</i> not seen, limit <i>b</i>..... | ..... | <44 | <10 | low | ... | ... |
| 21 | Dec. 29 | 6 | 4288.50 | 150 | 6 | <i>v</i> not seen, limit <i>u</i>..... | ..... | ..... | <12.3 | good | ... | ... |
| 22 | 31 | 18 | 4291.00 | 150 | 6 | | | | | | | |
| 23 | 1898 Jan. 18 | 18 | 4309.00 | 150 | 6 | <i>s2v</i> ?, limit <i>v</i>? | ..... | 25.3 | 13.01 | fair | 149 | -0.28 |
| 24 | 28 | 18 | 4319.00 | 150 | 6 | <i>f1-2v</i> , <i>vo</i> , <i>v3s</i> | 35.7, 33.4, 30.3..... | 33.1 | 11.79 | good | 159 | -0.89 |
| 25 | Feb. 12 | 18 | 4334.00 | 150 | 6 | <i>vfj</i>..... | ..... | 38.2 | 10.97 | fair | 174 | -0.40 |
| 26 | 15 | 17 | 4336.96 | 150 | 6 | <i>vo-1f</i> , <i>d3-4v</i> | 37.7, 36.3..... | 37.0 | 11.17 | good | 176 | -0.02 |
| 27 | 24 | 18 | 4345.98 | 150 | 6 | <i>vfj</i> , <i>b6v</i> , <i>d1-2v</i> | 37.2, 38.6, 38.3..... | 38.0 | 11.00 | good | 185 | +0.24 |
| 28 | Mar. 2 | 17 | 4351.96 | 150 | 6 | <i>v2f</i> , <i>b6v</i> , <i>v1-2d</i> | 39.2, 38.6, 41.3..... | 39.7 | 10.73 | good | 191 | +0.12 |
| 29 | 23 | 17 | 4372.96 | 40 | 6 | <i>b4v</i> , <i>vid</i> , <i>v4f</i> | 40.6, 40.8, 41.2..... | 40.8 | 10.53 | good | 12 | -0.16 |
| 30 | Apr. 1 | 16 | 4381.92 | 40 | 6 | <i>d1v</i> , <i>vfj</i> , <i>v30</i> , <i>b5v</i> | 38.8, 37.2, 36.4, 39.6..... | 38.0 | 11.00 | good | 21 | +0.18 |
| 31 | 11 | 9 | 4391.63 | 150 | 6 | <i>o1v</i> , <i>f3v</i> , <i>v1r</i> | 32.4, 34.2, 34.3..... | 33.6 | 11.70 | fair | 31 | +0.66 |
| 32 | 15 | 16 | 4395.92 | 150 | 6 | <i>o1v</i> , <i>vp</i> , <i>f3v</i> , <i>v2r</i> | 32.4, 30.3, 34.2, 35.3..... | 33.0 | 11.80 | good | 35 | +0.65 |
| 33 | 26 | 9 | 4406.63 | 150 | 6 | <i>r4v</i> , <i>v2s</i> , <i>u1v</i> | 29.3, 29.3, 34.8..... | 31.1 | 12.10 | good | 46 | +0.65 |
| 34 | May 7 | 9 | 4417.63 | 150 | 6 | <i>s3v</i> , <i>t1v</i> , limit <i>v</i> | 24.3, 25.0..... | 24.6 | 13.13 | fine | 57 | +1.33 |
| 35 | June 13 | .. | 4454 | .. | 12 | <i>v</i> not seen, limit <i>8-10</i> < <i>s</i>..... | ..... | <18 | <14.1 | good | 94 | ... |
| 36 | 13 | .. | 4454 | .. | 24 | <i>v</i> not seen, limit <i>2M</i> < <i>s</i>..... | ..... | ..... | <14.7 | good | 94 | ... |
| 37 | 21 | 12 | 4462.75 | .. | 12 | <i>vk</i>..... | ..... | 9.5 | 15± | ... | 102 | +0.8± |
| 38 | 25 | 12 | 4466.75 | 275 | 12 | <i>v</i> seen, limit <i>2M</i> < <i>s</i>..... | ..... | ..... | 14.7± | fair | 106 | +0.3± |
| 39 | July 6 | 10 | 4477.67 | 80 | 12 | <i>v</i> suspected, <i>s</i> 3-4v?..... | ..... | 23.8 | 13.27 | moon | 117 | ... |
| 40 | 7 | 13 | 4478.79 | .. | 40 | <i>P2v</i> , <i>v3-4k</i> | 12.5, 12.0..... | 12.2 | 14.97 | ... | 118 | +0.50 |
| 41 | July 21 | 10 | 4492.67 | .. | 8 | <i>v</i> not seen, limit <i>6</i> < <i>s</i>..... | ..... | <21 | <13.7 | good | 132 | ... |
| 42 | 23 | 10 | 4494.65 | .. | 12 | <i>v</i> is <i>1½M</i> < <i>s</i>..... | ..... | ..... | 14.2± | good | 134 | +0.1± |
| 43 | Aug. 8 | 10 | 4510.67 | .. | 12 | <i>s3-4v</i>..... | ..... | 23.8 | 13.28 | good | 150 | +0.03 |
| 44 | 18 | 10 | 4520.67 | 80 | 12 | <i>v20</i> , <i>r3v</i> , <i>f4v</i> | 35.4, 30.3, 33.2..... | 32.9 | 11.82 | good | 160 | -0.68 |
| 45 | 22 | 9 | 4524.63 | 80 | 12 | <i>v8s</i> , <i>v2-3r</i> , <i>ov</i> , <i>f5-6v</i> | 35.3, 35.8, 33.4, 31.7..... | 34.0 | 11.67 | ... | 164 | -0.38 |
| 46 | 24 | 10 | 4526.65 | 175 | 12 | <i>s10a±</i>..... | ..... | ..... | ..... | fair | ... | ... |
| 47 | 27 | 9 | 4529.65 | 150 | 6 | <i>v2r</i> , <i>f3v</i> , <i>v10</i> , <i>d4v</i> | 35.3, 34.2, 34.4, 35.8..... | 34.4 | 11.58 | good | 169 | -0.15 |
| 48 | Sept. 2 | 9 | 4535.61 | 150 | 6 | <i>f2v</i> , <i>v3r</i> , <i>d4v</i> , <i>v30</i> | 35.2, 36.3, 35.8, 36.4..... | 35.9 | 11.32 | good | 175 | +0.06 |
| 49 | 7 | .. | 4540 | 150 | 6 | <i>d1-2v</i> , <i>v3-40</i> , <i>fo-1v</i> , <i>v4r</i> | 37.3, 36.9, 35.7, 37.3..... | 36.8 | 11.20 | good | 180 | +0.22 |
| 50 | 20 | 8 | 4553.56 | 150 | 6 | <i>b6-7v</i> , <i>v2-3f</i> , <i>v1-2d</i> | 38.1, 39.7, 41.3..... | 39.7 | 10.71 | fair | 193 | +0.14 |
| 51 | Oct. 5 | 7 | 4568.54 | 150 | 6 | <i>b5-6v</i> , <i>v4f</i> , <i>v2d</i> | 39.1, 41.2, 41.8..... | 40.7 | 10.55 | good | 8 | -0.06 |
| 52 | 11 | 6 | 4574.52 | 80 | 6 | <i>b5v</i> , <i>do-1v</i> , <i>v4f</i> | 39.6, 39.3, 41.2..... | 40.0 | 10.66 | good | 14 | -0.03 |

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|--|--------------------------|--------|-------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1898 | | 2410000+ | | | | | | | | | |
| 53 | Oct. 15 | 6 | 4578.52 | 80 | 6 | d2v, f2v, v4r | 37.8, 35.2, 37.3... | 36.7 | 11.20 | good | 18 | +0.42 |
| 54 | 31 | 7 | 4594.54 | 150 | 6 | d1-2v, v30, f2v, v4r | 38.3, 36.4, 35.2, 37.3 | 36.8 | 11.19 | fair | 34 | +0.07 |
| 55 | Nov. 5 | 6 | 4599.50 | 150 | 6 | f5v, r1v, o1v, v6s | 32.2, 32.3, 32.4, 33.3 | 32.5 | 11.88 | good | 39 | +0.62 |
| 56 | 11 | 8 | 4605.58 | 150 | 6 | o2-3v, v2-3s | 30.9, 29.8 | 30.3 | 12.22 | fair | 45 | +0.80 |
| 57 | 12 | 7 | 4606.52 | 150 | 6 | o3-4v, v1s | 29.9, 29.3 | 29.6 | 12.35 | fair | 46 | +0.90 |
| 58 | 19 | 6 | 4613.50 | 150 | 6 | s1v | | 26.3 | 12.87 | moon | 53 | +1.24 |
| | 1899 | | | | | | | | | | | |
| 59 | Jan. 8 | 18 | 4664.00 | 150 | 6 | v glimpsed, limit 2 < s | | <25 | <13.0 | poor | ... | ... |
| 60 | 10 | 18 | 4666.00 | 200 | 6 | v not seen, limit 3-4 < s... | | <24 | <13.2 | ... | ... | ... |
| 61 | Feb. 15 | 17 | 4701.96 | 150 | 6 | r4v, v0-1s | 29.3, 27.8 | 29.6 | 12.35 | good | 141 | -1.37 |
| 62 | Mar. 4 | 17 | 4718.96 | 150 | 6 | f2v, v4r, v40, v0-1d | 35.2, 37.3, 37.4, 40.3 | 37.6 | 11.06 | fair | 158 | -1.59 |
| 63 | 19 | 17 | 4733.96 | ... | 6 | v1b, e6v, v3-4d | 45.1, 45.2, 43.3 | 44.5 | 9.88 | good | 173 | -1.54 |
| 64 | Apr. 4 | 16 | 4749.92 | 40 | 6 | v1b, e3-4v | 45.6, 47.7 | 46.6 | 9.66 | good | 189 | -0.99 |
| 65 | 16 | 15 | 4761.88 | 40 | 6 | e6v, v1b, v7-8d | 45.2, 45.6, 47.3 | 45.9 | 9.77 | good | 1 | -0.78 |
| 66 | 21 | 15 | 4766.88 | 40 | 6 | e6-7v, v0, v6d | 44.7, 44.6, 45.8 | 44.9 | 9.84 | good | 6 | -0.75 |
| 67 | 28 | 9 | 4773.63 | 40 | 6 | e6-8v, b1v, v5d | 44.2, 43.6, 44.8 | 44.0 | 9.99 | good | 13 | -0.71 |
| 68 | May 1 | 9 | 4776.63 | 40 | 6 | b2v, v4d | 42.6, 43.8 | 43.3 | 10.10 | good | 16 | -0.64 |
| | | | | 150 | 6 | b2-3v, v5d | 42.1, 44.8 | | | | | |
| 69 | 4 | 9 | 4779.63 | 40 | 6 | b2v, v2d | 42.6, 41.8 | 42.6 | 10.23 | fair | 19 | -0.56 |
| | | | | 150 | 6 | b2v, v3-4d | 42.6, 43.3 | | | | | |
| 70 | 9 | 9 | 4784.63 | 40 | 6 | b3v, v2-3d | 41.6, 42.3 | 42.0 | 10.31 | fair | 24 | -0.58 |
| | | | | 150 | 6 | b2-3v, v2-3d | 42.1, 42.1 | | | | | |
| 71 | 18 | 9 | 4793.63 | 40 | 6 | b6-8v, d2v | 37.6, 37.8 | 37.4 | 11.05 | fair | 33 | -0.06 |
| | | | | 150 | 6 | d2-3v, v1f, v4r | 37.3, 37.2, 37.3 | | | | | |
| 72 | 29 | 9 | 4804.63 | 150 | 6 | f3-4v, v1, o1v, v4s | 33.7, 33.3, 32.4, 31.3 | 32.7 | 11.85 | good | 44 | +0.46 |
| 73 | June 3 | 9 | 4809.63 | 150 | 6 | r2-3v, v3s | 30.8, 30.3 | 30.6 | 12.19 | good | 49 | +0.66 |
| 74 | 13 | 9 | 4819.63 | 150 | 6 | s3v | | 24.3 | 13.16 | good | 59 | +1.63 |
| 75 | 24 | 9 | 4830.63 | 150 | 6 | v not seen, limit 1-2 < s... | | <26 | <12.9 | fair | 70 | ... |
| 76 | July 8 | 9 | 4844.63 | 200 | 6 | v not seen, limit 3-4 < s... | | <24 | <13.1 | good | ... | ... |
| 77 | Oct. 7 | 7 | 4935.54 | 150 | 6 | v2r, f2v, v2-30, d1v | 35.3, 35.2, 35.9, 38.8 | 36.3 | 11.26 | fair | 175 | +0.02 |
| 78 | 17 | 7 | 4945.54 | 80 | 6 | v2d, v3-4f, b4v | 41.8, 40.7, 40.6 | 41.0 | 10.48 | fair | 185 | -0.30 |
| 79 | 24 | 6 | 4952.50 | 150 | 6 | v4f, b6v±, v3d | 41.2, 38.6, 42.8 | 41.3 | 10.43 | fair | 192 | -0.16 |
| 80 | 30 | 6 | 4958.50 | 150 | 6 | b3-4v, v4f, v3d | 41.1, 41.2, 42.8 | 41.7 | 10.37 | fair | 198 | -0.15 |
| 81 | Nov. 4 | 6 | 4963.50 | 150 | 6 | b3v, v3-4d, v4f | 41.6, 43.3, 41.2 | 42.0 | 10.31 | good | 3 | -0.26 |
| 82 | 15 | 6 | 4974.50 | 150 | 6 | b4v, v4f | 40.6, 41.2 | 40.9 | 10.50 | fair | 14 | -0.21 |
| 83 | 20 | 6 | 4979.50 | 40 | 6 | b4v, v2d | 40.6, 41.8 | 41.3 | 10.43 | fair | 19 | -0.37 |
| | | | | 150 | 6 | b4v, v2-3d | 40.6, 42.3 | | | | | |
| 84 | Nov. 26 | 6 | 4985.50 | 40 | 6 | b5v, v1d, v2f | 39.6, 40.8, 39.2 | 40.1 | 10.62 | good | 25 | -0.29 |
| | | | | 150 | 6 | b6v, v2d, v3-4f | 38.6, 41.8, 40.7 | | | | | |
| 85 | Dec. 5 | 6 | 4994.50 | 40 | 6 | d4v, v1-20 | 35.8, 34.9 | 36.1 | 11.29 | fair | 34 | +0.71 |
| | | | | 150 | 6 | d1-2v, v20 | 38.3, 35.4 | | | | | |
| 86 | 26 | 18 | 5016.00 | 200 | 6 | s2v ? | | 25± | 13.0 | fair | 56 | +1.23 |
| | 1900 | | | | | | | | | | | |
| 87 | Jan. 7 | .. | 5027 | 200 | 6 | v not seen, limit 4 < s... | | <23 | <13.4 | good | ... | ... |
| 88 | 20 | 15 | 5040.88 | 350 | 40 | v glimpsed, not < 15 ^m | | ... | 15± | fair | 80 | ... |
| 89 | 26 | 15 | 5046.88 | 350 | 40 | P2v, v1δ, v3k, v2β | 12.5, 12.4, 11.5, 12.0 | 12.1 | 14.96 | good | 86 | +1.73 |
| 90 | Feb. 5 | 16 | 5056.92 | 350 | 40 | p4v, vδ, v3k, v1β | 10.1, 11.4, 11.5, 11.0 | 11.1 | 15.09 | good | 96 | +1.20 |
| 91 | 18 | 15 | 5069.88 | 350 | 40 | v not seen, limit 1½ ^m < s... | | ... | <14.2 | poor | ... | ... |
| 92 | 22 | 15 | 5073.88 | 350 | 40 | P6v, δ3v, v0-1k | 8.5, 8.4, 9.0 | 8.6 | 15.45 | fair | 113 | +0.99 |
| 93 | 25 | 18 | 5076.98 | 350 | 40 | v not held, k and δ glimpsed | | < 8.5 | <15.5 | poor | ... | ... |
| 94 | Mar. 7 | .. | 5086 | 275 | 12 | v not seen, limit 4-5 < a... | | <22.4 | <13.5 | good | ... | ... |
| 95 | 15 | .. | 5094 | 350 | 40 | v not seen, limit 1 ^m < s... | | ... | <13.7 | moon | ... | ... |
| 96 | 22 | 12 | 5101.75 | 350 | 40 | v4P, η2v, α8-10v, v5p | 18.5, 13.7, (17.9), 19.5 | 15.9 | 14.41 | good | 141 | +0.68 |
| 97 | Apr. 4 | 15 | 5114.88 | 275 | 12 | va, s3-4v, v2v | 26.9, 23.8, 17.4 | 22.7 | 13.42 | good | 154 | +0.44 |
| | | | | 275 | 12 | η1β, β limit | | | | | | |
| 98 | 17 | 9 | 5125.63 | 150 | 6 | v1-2s | | 28.8 | 12.49 | poor | 165 | +0.40 |
| | | | | 134 | 12 | v2s, v4a, v1-2v | 29.3, 30.9, 31.8 | | | | | |
| 99 | 18 | 9 | 5126.63 | 275 | 12 | v1s± | 28.3 | 30.0 | 12.29 | good | 166 | +0.30 |

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|--------------------|---------|-----------|---|-------------------------------------|--------|--------|---------|------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T | | | | | Steps. | Mag. | | | |
| | 1900 | | 2410000+ | | | | | | | | | |
| 100 | Apr. 30 | 10 | 5140.67 | 150 | 6 | f1v, v0, v4r, v6s | 36.2, 33.4, 37.3, 33.3 | 35.0 | 11.49 | .... | 180 | +0.50 |
| 101 | May 19 | 9 | 5159.63 | 150 | 6 | f0-1v, v20 | 36.7, 35.3 | 36.0 | 11.30 | good | 199 | +0.77 |
| 102 | 31 | 13 | 5171.79 | 237 | 40 | f1v, v2r, v6s, v0 | 36.2, 35.3, 33.3, 33.4 | 34.5 | 11.38 | fair | 11 | +0.71 |
| 103 | June 17 | 9 | 5188.63 | 150 | 6 | f4v, v2-3r, v20 | 33.2, 35.8, 35.4 | 34.8 | 11.51 | good | 28 | +0.53 |
| 104 | July 12 | 10 | 5213.69 | 237 | 40 | {photometer, 10 ^M .32v. (10 ^M .15s | .... | .... | 12.26 | fair | 53 | +0.63 |
| 105 | 21 | 9 | 5222.63 | 150 | 6 | s3v± | .... | 24.3 | 13.17 | fair | 62 | +1.19 |
| 106 | Aug. 30 | 9 | 5262.63 | 350 | 40 | η3v, v8, v1P, v4δ | 12.7, 10.0, 15.5, 15.4 | 13.4 | 14.77 | good | 102 | +0.57 |
| 107 | Sept. 12 | 9 | 5275.63 | 75 | 12 | v not seen, limit 1 < α | .... | .... | .... | .... | .... | .... |
| | | | | | | {photometer 10 ^M .70v. (10 ^M .06β | 11.0 | 11.2 | 14.96 | good | 116 | +0.48 |
| 108 | 13 | 8 | 5276.58 | 237 | 40 | {P2-3v, v8, v2-3k, η5v, v1β. v not seen, limit η | 12.0, 11.4, 11.0, 10.7 | .... | .... | .... | .... | .... |
| 109 | Oct. 4 | 8 | 5297.58 | 237 | 40 | s6v, v5-6η, α3-4v | 21.3, 21.2, 23.4 | 21.9 | 13.53 | fair | 137 | -0.38 |
| 110 | 16 | 9 | 5309.63 | 450 | 40 | s1v, o5v, limit v | 26.3, 28.4 | 27.3 | 12.71 | fair | 149 | -0.57 |
| 111 | 26 | 7 | 5319.54 | 150 | 6 | | | | | | | |
| | 1901 | | | | | | | | | | | |
| 112 | May 18 | 9 | 5523.63 | 80 | 12 | s5v, v near limit | .... | 22.3 | 13.47 | good | 163 | +1.23 |
| 113 | June 3 | 10 | 5539.67 | 237 | 40 | r2v, v5s | 31.3, 32.3 | 31.8 | 12.00 | fair | 179 | +0.57 |
| 114 | July 20 | .. | 5586 | ... | 24 | {θ, ε, γ, and β near limit. {P and δ seen, but not k. | limit of 24-inch 15 ^M .2 | .... | .... | .... | .... | .... |
| 115 | Oct. 18 | 8 | 5676.58 | 80 | 12 | v not seen, limit α | .... | <26.9 | <12.8 | fair | ... | .... |
| 116 | 31 | 7 | 5689.54 | ... | .. | v not seen, γ glimpsed | .... | <16 | <14 | .... | ... | .... |
| 117 | Nov. 7 | 8 | 5696.58 | 60 | 24 | v not seen, limit 2-3 < α | .... | <24.4 | <13.2 | .... | ... | .... |
| 118 | 12 | 7 | 5701.54 | 350 | 40 | η5v, v1β, P3v, v2k, δ1v | {10.7, 11.0, 11.5, 10.4 10.5 | 10.8 | 15.13 | fair | 141 | +1.41 |
| | 1902 | | | | | | | | | | | |
| 119 | Feb. 3 | 17 | 5784.96 | 80 | 12 | b4-5v, v3d | 40.1, 42.8 | 41.4 | 10.40 | fair | 24 | -0.49 |
| 120 | Mar. 5 | 11 | 5814.71 | 237 | 40 | v is between f and r | .... | 35± | 11.48 | .... | 54 | -0.20 |
| 121 | 28 | 16 | 5837.92 | 237 | 40 | vr | .... | 33.3 | 11.77 | good | 77 | -0.93 |
| 122 | July 27 | .. | 5858 | ... | 24 | photograph | .... | .... | 11.9± | .... | ... | .... |
| 123 | Oct. 1 | 8 | 6024.58 | 237 | 40 | photometer | .... | .... | 10.51 | poor | 64 | -1.58 |
| | 1903 | | | | | | | | | | | |
| 124 | Mar. 20 | 17 | 6194.96 | 237 | 40 | v5-6f | .... | 42.7 | 10.22 | fair | 34 | -0.89 |
| 125 | Apr. 4 | 15 | 6209.88 | 40 | 6 | photometer | .... | .... | 10.96 | good | 49 | -0.57 |
| 126 | May 17 | .. | 6252 | 67 | 12 | v not seen, limit o | .... | <33 | <11.8 | poor | ... | .... |
| 127 | July 24 | .. | 6320 | 350 | 40 | s6-8v, v2η | 20.3, 17.7 | 19.0 | 13.98 | poor | 160 | +1.49 |
| 128 | Sept. 20 | .. | 6378 | 40 | 6 | photometer | .... | .... | 10.71 | good | 18 | -0.07 |
| | 1904 | | | | | | | | | | | |
| 129 | May 14 | .. | 6615 | 40 | 6 | b6v, vd, v5f | 38.6, 39.8, 42.2 | 39.9 | 10.69 | good | 55 | -1.02 |
| 130 | June 19 | .. | 6651 | ... | 24 | o3v, v3s, r4-5v | 30.4, 30.3, 28.8 | 29.8 | 12.31 | good | 91 | -1.01 |
| 131 | July 1 | 10 | 6662.67 | 60 | 24 | s2-3v, v5α | 24.8, 31.9 | 28.4 | 12.55 | good | 102 | -1.65 |
| 132 | 31 | .. | 6693 | 40 | 6 | v not seen, limit 1 ^M < s | .... | .... | <13.7 | fine | ... | .... |
| 133 | Aug. 4 | 10 | 6697.67 | 67 | 12 | v not held, perhaps α 1-2v | .... | <25.4 | <13.00 | fair | 137 | -0.91 |
| 134 | 11 | 10 | 6704.67 | 67 | 12 | v not seen, limit 4 < α | .... | <23 | <13.4 | good | ... | .... |
| 135 | Sept. 2 | .. | 6726 | 67 | 12 | v perhaps glimpsed, α3v? | .... | 23.9 | 13.2 | good | 166 | +1.2± |
| 136 | 14 | .. | 6738 | ... | 24 | photograph | .... | .... | .... | .... | ... | .... |
| 137 | Oct. 8 | 9 | 6762.61 | 237 | 40 | s8-10v, v8-10α | 18.3 | .... | .... | .... | ... | .... |
| 138 | Nov. 30 | 6 | 6815.50 | 40 | 6 | b4v, v2d | 40.6, 41.8 | 41.2 | 10.47 | fair | 55 | -1.24 |
| | 1905 | | | | | | | | | | | |
| 139 | Jan. 12 | 18 | 6859.00 | 40 | 6 | r2v, v7s | 31.3, 34.3 | 32.0 | 11.95 | fair | 99 | -2.08 |
| 140 | Feb. 14 | 16 | 6891.92 | 250 | 40 | α6-8v, v5η | 19.9, 20.7 | 20.3 | 13.77 | good | 131 | -0.30 |
| 141 | Mar. 5 | 16 | 6910.88 | 237 | 40 | o6-8v, v2α | 26.4, 28.9 | 28.1 | 12.58 | fair | 151 | -0.61 |
| 142 | 12 | 13 | 6917.77 | 237 | 40 | s3v, v6α | 24.3, 32.9 | 26.5 | 12.82 | good | 157 | +0.10 |
| 143 | 26 | 13 | 6931.79 | 237 | 40 | η4-5v, vP, α10v± | 11.2, 14.5, (16.9) | 13.4 | 14.76 | fair | 171 | +2.36 |
| 144 | Apr. 4 | 15 | 6940.88 | 237 | 40 | η2v, v5P | 13.7, 19.5 | .... | .... | .... | 180 | +3.45 |
| 145 | 11 | 16 | 6947.92 | 237 | 40 | s10-12v, vα, v6η | 16.3, 23.3, 21.7 | 22.9 | 13.40 | good | 187 | +2.65 |
| 146 | Apr. 22 | 10 | 6958.67 | 237 | 40 | s4v, v6α | 23.3, 29.3 | 26.3 | 12.88 | fair | 198 | +2.33 |

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | <i>t</i> . | Δ Mag. |
|-----|----------------|-------------|---------------------|---------|-----------|------------------------------------|-----------------------|--------|-------|---------|------------|---------------|
| | Month and Day. | Hour C.S.T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1905 | | 2410000+ | | | | | | | | | |
| 147 | Apr. 30 | 13 | 6966.79 | 237 | 40 | <i>v1-2s</i> | | 28.8 | 12.48 | good | 6 | +1.98 |
| 148 | May 31 | 9 | 6997.63 | 40 | 6 | <i>e8v, vb, v7d</i> | 43.2, 44.6, 46.8... | 44.8 | 9.85 | good | 37 | -1.35 |
| 149 | June 13 | 14 | 7010.83 | 237 | 40 | photometer | | | 10.00 | good | 50 | -1.6± |
| 150 | 22 | 9 | 7019.63 | 150 | 6 | <i>v3b, v4d, e8v</i> | 47.6, 43.8, 43.2... | 45.2 | 9.79 | fair | 59 | -2.12 |
| 151 | July 24 | 9 | 7051.63 | 150 | 6 | <i>d2v, v2f</i> | 37.8, 39.2 | 38.5 | 10.90 | fair | 91 | -2.70 |
| 152 | Aug. 9 | 8 | 7067.60 | 150 | 6 | <i>s1-2v±</i> | | 25.8 | 12.92 | moon | 107 | -1.39 |
| 153 | 20 | 9 | 7068.62 | 237 | 40 | <i>s5v, v3-4^a</i> | 22.3, 26.8 | 24.6 | 13.11 | poor | 118 | -1.31 |
| 154 | 22 | 9 | 7080.63 | 237 | 40 | <i>s3-4v, v1^a</i> | 23.8, 24.3 | 24.1 | 13.19 | good | 120 | -1.33 |
| 155 | Sept. 2 | 12 | 7091.75 | 237 | 40 | <i>a5v, v4ⁿ</i> | 18.3, 19.7 | 19.0 | 13.96 | fair | 131 | -0.14 |
| 156 | 19 | 11 | 7108.71 | 237 | 40 | <i>η3v, v1-2β</i> | 12.7, 11.5 | 12.1 | 14.95 | fair | 148 | +2.15 |
| 157 | Oct. 21 | 8 | 7140.58 | 237 | 40 | <i>η4v, v1P</i> | 11.7, 15.5 | 13.6 | 14.75 | good | 180 | +3.76 |
| 158 | 31 | 7 | 7150.54 | 237 | 40 | <i>a3v, v3 v8P±</i> | 20.3, 18.7, (22.5)... | 19.5 | 13.89 | good | 190 | +3.21 |
| 159 | Nov. 18 | 6 | 7168.48 | 237 | 40 | <i>s1v, v7^a</i> | 26.3, 30.3 | 26.8 | 12.80 | good | 8 | +2.20 |

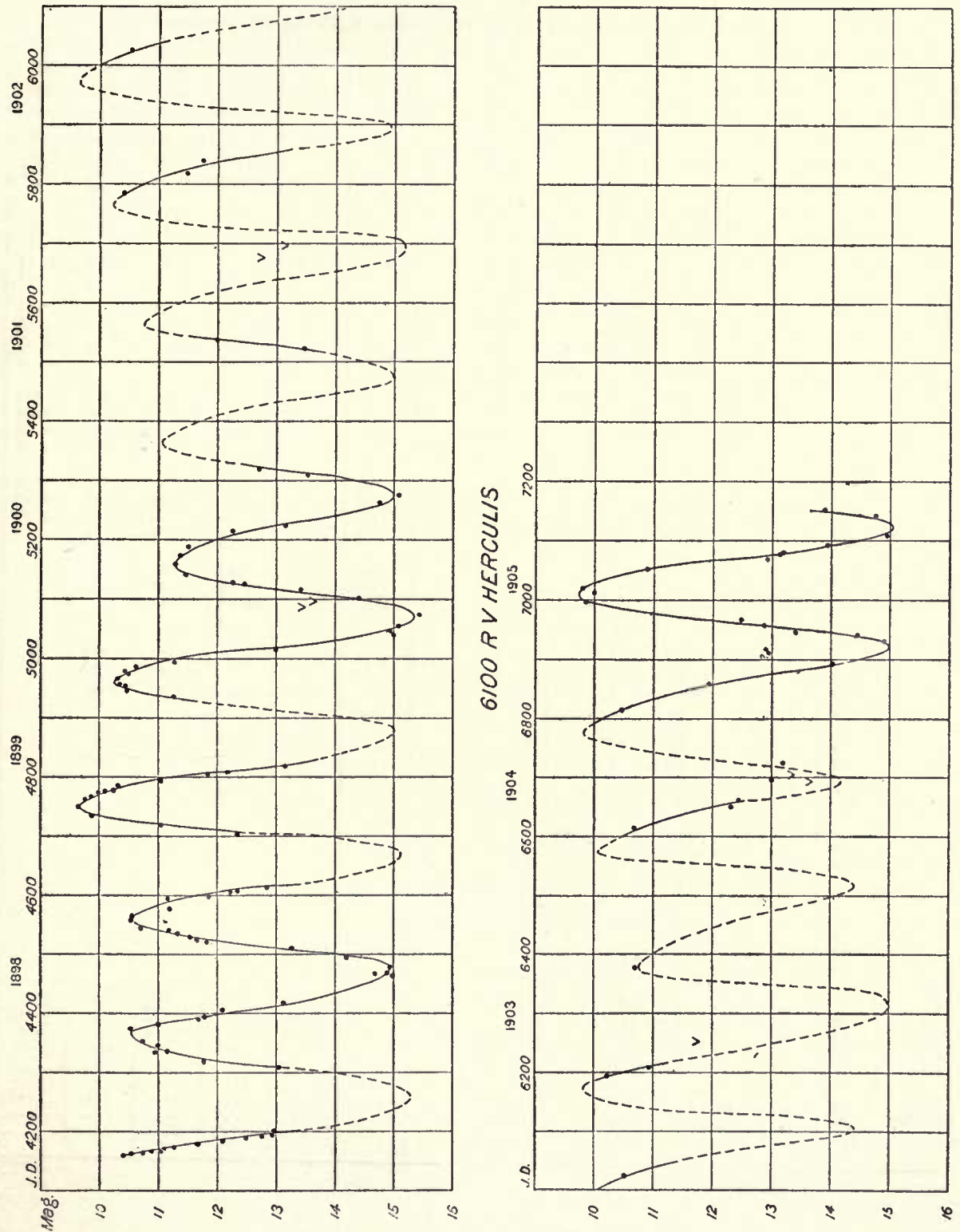


FIG 20.—LIGHT-CURVE OF RV HERCULIS.

TABLE 59.—6100 RV HERCULIS. MEAN MAGNITUDES FROM 16 $\frac{1}{2}$ DAY GROUPS.—Continued.

| Group No.... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D..... | 16 | 33 | 50 | 66 | 83 | 100 | 116 | 133 | 150 | 166 | 183 | 200 |
| 6560 { | <i>t</i> | .... | .... | .... | 55 | .... | 91 | 102 | .... | 137 | 166 | .... |
| | <i>M</i> | .... | .... | .... | 10.69 | .... | 12.31 | 12.55 | .... | 13.00 | 13.2± | .... |
| | ΔM | .... | .... | .... | -1.02 | .... | -1.01 | -1.65 | .... | -0.91 | +1.2± | .... |
| | No. | .... | .... | .... | 1 | .... | 1 | 1 | .... | 1 | .... | .... |
| 6760 { | <i>t</i> | .... | .... | .... | 55 | .... | 99 | .... | 131 | .... | 151 | .... |
| | <i>M</i> | .... | .... | .... | 10.47 | .... | 11.95 | .... | 13.77 | .... | 12.58 | .... |
| | ΔM | .... | .... | .... | -1.24 | .... | -2.08 | .... | -0.30 | .... | -0.61 | .... |
| | No. | .... | .... | .... | 1 | .... | 1 | .... | 1 | .... | 1 | .... |
| 6960 { | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Means { | <i>t</i> | 9 | 23 | 42 | 55 | 78 | 94 | 107 | 124 | 140 | 158 | 176 |
| | <i>M</i> | 10.62 | 11.02 | 11.87 | 11.91 | 13.5± | 13.10 | 14.44 | 14.37 | 13.77 | 12.64 | 11.18 |
| | ΔM | -0.03 | +0.15 | +0.52 | +0.32 | -0.58 | -0.21 | +0.12 | +0.10 | -0.27 | -0.08 | -0.04 |
| | No. | 17 | 14 | 17 | 7 | 2 | 4 | 6 | 2 | 7 | 14 | 9 |

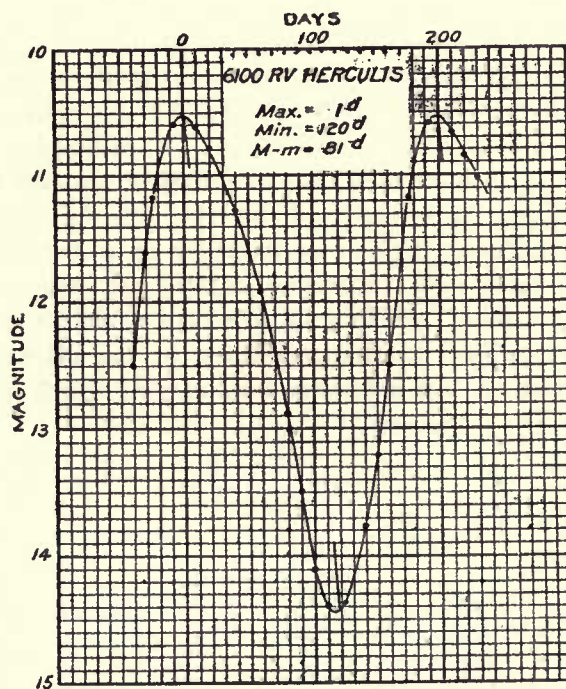


FIG. 21.—MEAN LIGHT-CURVE OF RV HERCULIS.

TABLE 60.—6100 RV HERCULIS. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1898, March 12 (J. D. 2414361) + 200^d E. $M - m = 81^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|-------|-------|-------|-----|---------|--------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| -1 | 1897 Aug. 23 | 4160 | ..... | mc | - 1 | 10 | 0 | 1897 Dec. 1 | 4260 | ..... | mc | -20 | 1 |
| 0 | 1898 Mar. 15 | 4364 | 10.50 | 10.75 | + 3 | 12 | 1 | 1898 July 2 | 4473 | 15.3 | 15.6 | - 7 | 8 |
| 1 | Sept. 28 | 4561 | 10.6 | 10.8 | 0 | 20 | 2 | 1899 Jan. 15 | 4670 | ..... | mc | -10 | 1 |
| 2 | 1899 Apr. 6 | 4751 | 9.68 | 9.93 | -10 | 17 | 3 | Aug. 11 | 4878 | ..... | mc | - 2 | 1 |
| 3 | Nov. 1 | 4960 | 10.25 | 10.50 | - 1 | 12 | 4 | 1900 Feb. 17 | 5068 | 15.35 | 15.60 | -12 | 12 |
| 4 | 1900 May 21 | 5161 | 11.30 | 11.55 | 0 | 12 | 5 | Sept. 11 | 5274 | 14.97 | 15.22 | - 6 | 8 |
| 5 | Dec. 6 | 5360 | ..... | mc | - 1 | 1 | 6 | 1901 Mar. 26 | 5470 | ..... | mc | -10 | 1 |
| 6 | 1901 June 29 | 5565 | ..... | mc | + 4 | 1 | 7 | Oct. 29 | 5687 | ..... | mc | + 7 | 2 |
| 7 | 1902 Jan. 22 | 5772 | ..... | mc | +11 | 2 | 8 | 1902 May 20 | 5890 | ..... | mc | +10 | 0 |
| 9 | 1903 Feb. 24 | 6170 | ..... | mc | + 9 | 2 | 9 | Dec. 16 | 6100 | ..... | mc | +20 | 0 |
| 10 | Sept. 22 | 6380 | ..... | mc | +19 | 1 | 10 | 1903 July 14 | 6310 | ..... | mc | +30 | 1 |
| 11 | 1904 Apr. 2 | 6572 | .. . | mc | +11 | 1 | 12 | 1904 Aug. 3 | 6696 | 14.0 | 14.2 | +16 | 2 |
| 12 | Oct. 18 | 6772 | ..... | mc | +11 | 3 | 13 | 1905 Mar. 15 | 6880 | 15.00 | 15.25 | +40 | 9 |
| 13 | 1905 June 14 | 7011 | 9.70 | 9.95 | +50 | 15 | 14 | Oct. 4 | 7123 | 15.40 | 15.65 | +43 | 12 |

The mean light-curve was derived from the observations up to 1905 March 5 (J. D. 6911). So far the period 200 days satisfied the measures, but the succeeding observations, covering the maximum and minimum of epoch 12, indicate a slightly longer period, perhaps 204 days. The light-curve has several notable features. The range is more than five magnitudes, unusually large for the length of period. The decline is as rapid as the rise, and the minimum is as sharply defined as the maximum. There is a suspicion of a secondary maximum arising from three anomalous observations near the minima of epochs 11 and 12, but the evidence is hardly sufficient to definitely settle the question. A considerable range will be noticed in the magnitude at the maxima, the star reaching 9.7 at epochs 2 and 12, but only reaching 11.3 at epoch 4.

CHAPTER VIII.

6894 S LYRÆ.

R. A. 19^h 9^m 6^s.3; Dec. + 25° 50' 17" (1900).

This star was numbered 868 by Espin, who noted a decline from 9th to 12th magnitude in 1893. The variability was confirmed by H. M. Parkhurst, and the notation was assigned by Chandler in *Astronomical Journal* 14, 111. The notation is confused in the *Nachrichten*, where this star is numbered 6895, while the number 6894 is given to X Lyræ, about 1° north of S.

Observations began in October, 1896; the places of the variable and the brighter comparison stars were measured with the 6-inch in that month, the places of the faint stars *s*, *x*, and those with Greek letters, were measured with the 40-inch in June, 1900. The stars *e*, *c*, and *E'* are in the Cambridge (Eng.) A. G. Catalogue. Using the coordinates in Table 63, the position of the variable relative to these stars results as given at the head of the page, with a probable error of $\pm 0^s.2$ and $\pm 0''.5$.

The photometric measures of the brighter comparison stars are a little above the average in accordance, the fainter stars a trifle below the average. The faint star β has a very discordant measure with the 40-inch on 1904 May 20, in good seeing. The suspicion of variability aroused seems to be confirmed by the photographs, but not by the other visual comparisons. It is therefore reserved for further investigation.

The photographic chart is given on a larger scale than usual in order to show clearly the close comparison stars α and β .

TABLE 61.—6894 S LYRÆ. STANDARD MAGNITUDE STARS.

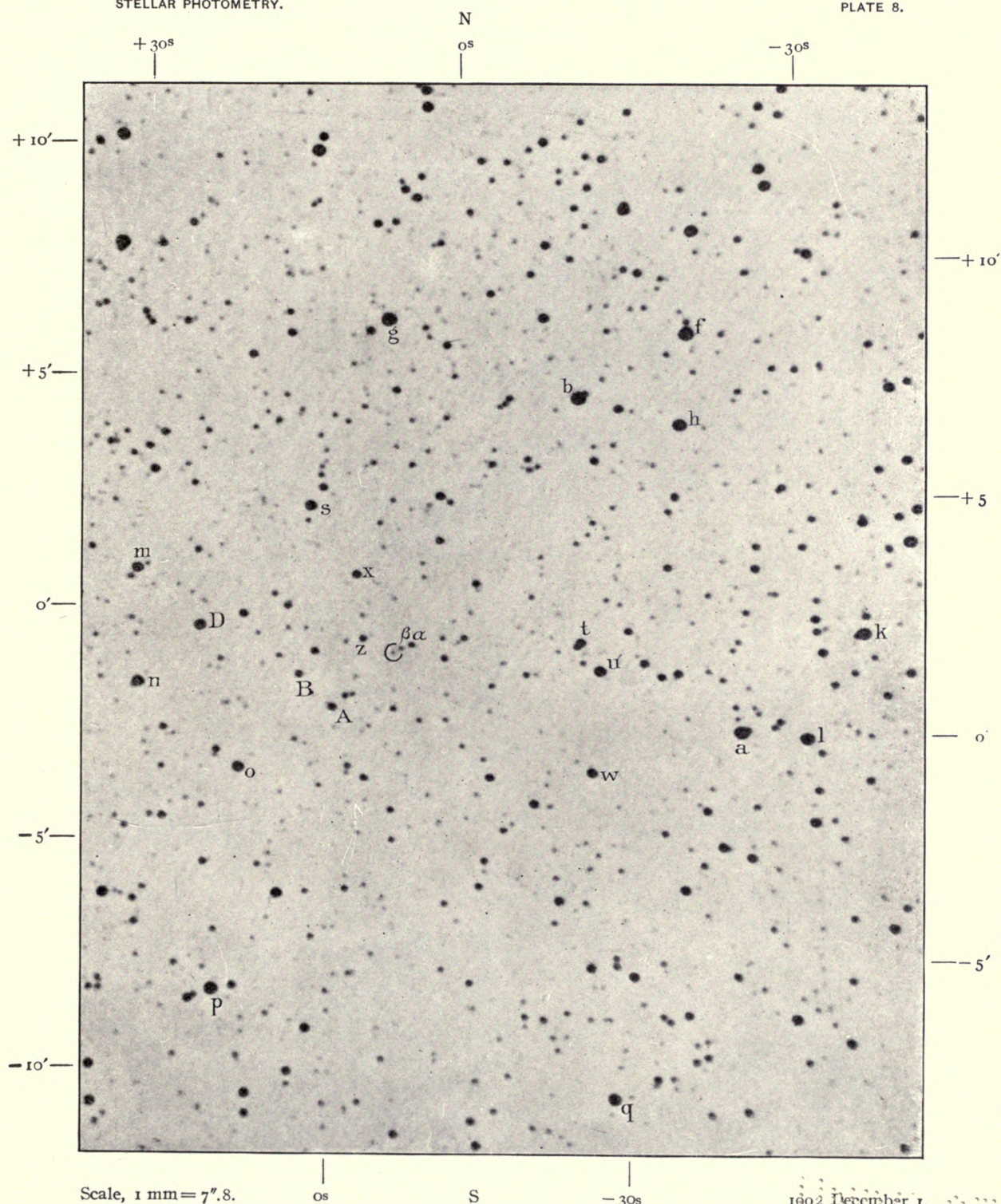
| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|-----------|---------------|--------------------------|---------------|-----------------|------------|--------|-----------|------|------------|-----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H. C. O. | P. DM. | H. | P. | H. | P. | |
| <i>E'</i> | ° +25 3757 | <i>h m s</i> 19 09 47 | ° +25 35.1 | GW | 6.88 | 7.24 | 6.91 | 7.33 | +3 | +9 | ±3 |
| <i>G'</i> | +26 3477 | 19 07 40 | +26 04.9 | GW | 7.40 | 7.97 | 7.45 | 7.87 | +5 | -10 | ±2 |
| <i>H'</i> | +24 3687 | 19 10 11 | +24 50.6 | W | 7.16 | 7.50 | 7.10 | 7.52 | -6 | +2 | ±3 |
| | Mean .. | ..... | ..... | ..... | 7.15 | 7.57 | 7.15 | 7.57 | ±5 | ±7 | ±3 |

TABLE 62.—COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|----------|------|--------------|----------|----------|----------|------|--------------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | ° | | <i>h m s</i> | ° ' " | | ° | | <i>h m s</i> | ° ' " |
| <i>e</i> | +25 3748 | 8.8 | 19 6 27 | +25 30.4 | <i>b</i> | +25 3752 | 9.5 | 19 7 02 | +25 51.9 |
| <i>a</i> | +25 3750 | 9.5 | 19 6 41 | +25 45.2 | <i>c</i> | +25 3755 | 8.9 | 19 7 44 | +25 58.1 |

TABLE 63.—COMPARISON STARS FOR S LYRÆ (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|-----------|----------------------------|----------|------|---------------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured | | From Curve. | |
| | | | | | H. | P. | H. | P. |
| | " | <i>s</i> | " | | | | | |
| <i>e</i> | -637 | -47.1 | -922 | 44.2 | .... | .... | 8.40 | 8.82 |
| <i>k</i> | -604 | -44.6 | +113 | 24.6 | .... | .... | 11.18 | 11.60 |
| <i>r</i> | -574 | -42.4 | -602 | 29.6 | .... | .... | 10.50 | 10.92 |
| <i>l</i> | -553 | -40.9 | -28 | 24.6 | .... | .... | 11.18 | 11.60 |
| <i>a</i> | -465 | -34.4 | -35 | 34.2 | 9.69 | 10.11 | .... | .... |
| <i>q</i> | -371 | -27.4 | -525 | 29.6 | .... | .... | 10.50 | 10.92 |
| <i>h</i> | -326 | -24.1 | +344 | 25.6 | .... | .... | 11.05 | 11.47 |
| <i>f</i> | -318 | -23.5 | +463 | 32.6 | .... | .... | 10.06 | 10.48 |
| <i>w</i> | -281 | -20.8 | -115 | 23.5 | .... | .... | 11.34 | 11.76 |
| <i>u</i> | -281 | -20.8 | +14 | 24.5 | .... | .... | 11.21 | 11.63 |
| <i>t</i> | -241 | -17.8 | +47 | 21.0 | .... | .... | 11.67 | 12.09 |
| <i>b</i> | -192 | -14.2 | +360 | 34.3 | 9.86 | 10.23 | .... | .... |
| <i>α</i> | -22 | -1.5 | +13 | 2.3 | 14.01 | 14.43 | .... | .... |
| <i>β</i> | -9 | -0.7 | +8 | 0 | var.? | .... | .... | .... |
| <i>z</i> | +43 | +3.2 | +12 | 11.4 | 12.82 | 13.24 | .... | .... |
| <i>x</i> | +64 | +4.7 | +94 | 18.4 | 12.18 | 12.60 | .... | .... |
| <i>A</i> | +66 | +4.9 | -80 | .... | .... | .... | .... | .... |
| <i>g</i> | +67 | +5.0 | -399 | 30.6 | 10.46 | 10.88 | .... | .... |
| <i>B</i> | -117 | +8.6 | -46 | .... | .... | .... | .... | .... |
| <i>s</i> | -137 | +10.1 | +173 | 21.0 | 11.56 | 11.98 | .... | .... |
| <i>p</i> | +170 | +12.6 | -476 | 27.6 | .... | .... | 10.78 | 11.20 |
| <i>o</i> | +178 | +13.2 | -177 | 24.7 | .... | .... | 11.18 | 11.60 |
| <i>D</i> | +252 | +18.6 | -1 | 21.5 | 11.46 | 11.88 | .... | .... |
| <i>n</i> | +322 | +23.8 | -86 | 24.7 | .... | .... | 11.18 | 11.60 |
| <i>m</i> | +346 | +25.6 | +58 | 25.6 | 10.90 | 11.32 | .... | .... |
| <i>c</i> | +369 | +27.3 | +739 | 42.2 | .... | .... | 8.68 | 9.10 |
| <i>d</i> | +463 | +34.2 | -837 | .... | .... | .... | .... | .... |
| <i>E'</i> | +555 | +41.0 | -903 | .... | 6.91 | 7.33 | .... | .... |



6894 S LYRÆ.

R. A. 19^h 9^m 16^s.3. Dec. + 25° 50' 17", 1900.

1902 December 1.

TABLE 64.—6894 S LYRÆ. PHOTOMETER MEASURES OF COMPARISON STARS

| 1903 November 7. | | | 6-INCH. | | | | Good. | |
|-------------------|------------|-------------------------|-------------------------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 21 17 | 33 | <i>H'</i> _{a1} | 15.5 15.0 15.5 | 15.33 | 15.52 | 1.02 | 7.87 | 8.29 |
| | | <i>E'</i> _{a1} | 13.2 13.8 13.4 | 13.50 | 13.84 | 0.76 | 7.61 | 8.03 |
| | | <i>G'</i> _{a1} | 18.7 19.0 18.9 | 18.87 | 18.65 | 1.44 | 8.29 | 8.71 |
| | | <i>G'</i> | 12.2 12.3 12.7 | 12.40 | 12.45 | 0.56 | 7.41 | 7.83 |
| | | <i>a</i> | 31.3 31.6 31.9 | 31.60 | 32.02 | 2.94 | 9.79 | 10.21 |
| | | <i>b</i> | 33.0 32.8 33.0 | 32.93 | 33.20 | 3.07 | 9.92 | 10.34 |
| | | <i>g</i> | 37.9 37.2 37.2 | 37.43 | 37.27 | 3.59 | 10.44 | 10.86 |
| | | <i>g</i> | 36.8 37.1 37.4 | 37.10 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 33.9 33.3 33.2 | 33.47 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 32.5 32.4 32.4 | 32.43 | ..... | ..... | ..... | ..... |
| | | <i>G'</i> | 12.3 12.4 12.8 | 12.50 | ..... | ..... | ..... | ..... |
| | | <i>G'</i> _{a1} | 17.8 18.8 18.7 | 18.43 | ..... | ..... | ..... | ..... |
| | | <i>F'</i> _{a1} | 10.1 10.1 9.8 | 10.00 | ..... | ..... | ..... | ..... |
| | | <i>E'</i> _{a1} | 13.9 14.4 14.2 | 14.17 | ..... | ..... | ..... | ..... |
| | | <i>H'</i> _{a1} | 15.9 15.6 15.6 | 15.70 | ..... | ..... | ..... | ..... |
| 21 37 | 36 | | | | | | | |
| 1903 November 8. | | | Good. | | | | | |
| 21 12 | 31 | <i>g</i> | 36.1 36.1 36.3 | 36.17 | 36.67 | 3.53 | 10.32 | 10.74 |
| | | <i>b</i> | 33.0 33.7 33.7 | 33.47 | 33.17 | 3.07 | 9.86 | 10.28 |
| | | <i>a</i> | 31.2 31.6 31.6 | 31.47 | 31.32 | 2.84 | 9.63 | 10.05 |
| | | <i>F'</i> _{a1} | 6.0 6.1 5.7 | 5.93 | ..... | 0.03 | 6.82 | 7.24 |
| | | <i>G'</i> _{a1} | 17.8 18.3 18.6 | 18.23 | 18.40 | 1.40 | 8.19 | 8.61 |
| | | <i>E'</i> _{a1} | 15.0 14.9 15.0 | 14.97 | 14.90 | 0.92 | 7.71 | 8.13 |
| | | <i>H'</i> _{a1} | 15.4 15.2 16.2 | 15.60 | 15.55 | 1.01 | 7.80 | 8.22 |
| | | <i>H'</i> _{a1} | 16.0 15.2 15.3 | 15.50 | ..... | ..... | ..... | ..... |
| | | <i>E'</i> _{a1} | 14.7 15.0 14.8 | 14.83 | ..... | ..... | ..... | ..... |
| | | <i>G'</i> _{a1} | 18.8 18.3 18.6 | 18.57 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 31.2 31.0 31.3 | 31.17 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 33.1 32.6 32.9 | 32.87 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 37.1 37.1 37.3 | 37.17 | ..... | ..... | ..... | ..... |
| | | | | | | | | |
| | | | | | | | | |
| 21 38 | 34 | | | | | | | |
| 1903 November 24. | | | Seeing good; moon 6 days old. | | | | | |
| 23 4 | 51 | <i>G'</i> | 12.3 11.7 12.1 | 12.03 | 12.98 | 0.63 | 7.43 | 7.85 |
| | | <i>a</i> | 31.0 31.1 31.2 | 31.10 | 31.84 | 2.91 | 9.71 | 10.13 |
| | | <i>b</i> | 31.1 31.8 32.0 | 31.63 | 32.78 | 3.08 | 9.88 | 10.30 |
| | | <i>g</i> | 37.2 37.4 37.3 | 37.30 | 37.62 | 3.62 | 10.42 | 10.84 |
| | | <i>E'</i> _{a1} | 14.2 14.0 14.7 | 14.30 | 14.50 | 0.86 | 7.66 | 8.08 |
| | | <i>H'</i> _{a1} | 15.8 16.1 16.1 | 16.00 | ..... | 1.08 | 7.88 | 8.30 |
| | | <i>H'</i> | 9.7 10.9 9.9 | 10.17 | ..... | 0.30 | 7.10 | 7.52 |
| | | <i>E'</i> _{a1} | 15.1 14.8 14.2 | 14.70 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 38.1 37.8 37.9 | 37.93 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 34.1 33.8 33.9 | 33.93 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 33.1 32.2 32.4 | 32.57 | ..... | ..... | ..... | ..... |
| | | <i>G'</i> | 14.2 13.7 13.9 | 13.93 | ..... | ..... | ..... | ..... |
| | | <i>G'</i> _{a1} | 19.8 20.1 19.4 | 19.70 | ..... | ..... | ..... | ..... |
| | | | | | | | | |
| | | | | | | | | |
| 23 28 | 55 | | | | | | | |

TABLE 64.—6894 S LYRÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1902 July 7. | | | 12-INCH. | | | | Very good. | |
|---------------------|------------|------------------------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 16 30 | ° | <i>A'</i> | 14.7 13.4 13.3 | 13.80 | 12.47 | 0.72 | 8.05 | 8.47 |
| | | <i>B'</i> | 10.0 7.8 8.5 | 8.77 | ..... | 0.32 | 7.65 | 8.07 |
| | | <i>B'a₂</i> | 24.5 26.2 25.7 | 25.47 | 22.84 | 2.01 | 9.34 | 9.76 |
| | | <i>C'</i> | 16.8 18.0 18.3 | 17.70 | 17.39 | 1.37 | 8.70 | 9.12 |
| | | <i>E'a₂</i> | 16.2 17.9 17.6 | 17.23 | 15.25 | 1.08 | 8.41 | 8.83 |
| | | <i>a</i> | 26.9 28.8 28.5 | 28.07 | 27.47 | 2.41 | 9.74 | 10.16 |
| | | <i>b</i> | 30.5 31.0 30.0 | 30.50 | 29.25 | 2.58 | 9.91 | 10.33 |
| | | <i>g</i> | 33.8 32.4 33.0 | 33.07 | 33.49 | 3.02 | 10.35 | 10.77 |
| | | <i>s</i> | 44.0 45.3 46.2 | 45.17 | 44.30 | 4.25 | 11.58 | 12.00 |
| | | <i>m</i> | 39.0 39.8 39.2 | 39.33 | ..... | 3.69 | 11.02 | 11.44 |
| | | <i>s</i> | 42.2 43.7 44.4 | 43.43 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 33.2 34.7 33.8 | 33.90 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 27.2 28.9 27.9 | 28.00 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 28.0 26.2 26.4 | 26.87 | ..... | ..... | ..... | ..... |
| | | <i>E'a₂</i> | 11.2 14.7 13.9 | 13.27 | ..... | ..... | ..... | ..... |
| | | <i>C'</i> | 16.2 17.5 17.5 | 17.07 | ..... | ..... | ..... | ..... |
| | | <i>B'a₂</i> | 19.5 20.0 19.9 | 19.80 | ..... | ..... | ..... | ..... |
| 17 25 | | <i>A'</i> | 11.2 11.0 11.2 | 11.13 | ..... | ..... | ..... | ..... |
| 1902 October 5. | | | Seeing good. | | | | | |
| 21 5 | | <i>a</i> | 19.9 20.9 21.1 | 20.63 | 21.72 | 1.80 | 9.62 | 10.04 |
| | | <i>b</i> | 22.9 23.2 23.2 | 23.10 | 23.17 | 2.04 | 9.86 | 10.28 |
| | | <i>g</i> | 30.3 30.1 30.4 | 30.27 | 30.59 | 2.71 | 10.53 | 10.95 |
| | | <i>s</i> | 40.3 41.9 41.7 | 41.43 | 40.62 | 3.85 | 11.67 | 12.09 |
| | | <i>x</i> | 47.5 47.5 46.7 | 47.23 | 45.52 | 4.39 | 12.21 | 12.63 |
| | | <i>D</i> | 40.8 40.2 40.5 | 40.50 | 38.74 | 3.64 | 11.46 | 11.88 |
| | | <i>m</i> | 33.3 34.6 34.1 | 34.00 | 33.26 | 3.00 | 10.82 | 11.24 |
| | | <i>E'a₂</i> | 12.9 13.2 12.9 | 13.00 | 12.24 | 0.70 | 8.52 | 8.94 |
| | | <i>C'</i> | 14.3 14.3 14.0 | 14.20 | 14.35 | 0.91 | 8.73 | 9.15 |
| | | <i>B'a₂</i> | 16.8 16.5 16.8 | 16.70 | 16.20 | 1.22 | 9.04 | 9.46 |
| | | <i>A'a₂</i> | 25.1 24.7 25.0 | 24.93 | ..... | 2.19 | 10.01 | 10.43 |
| | | <i>A'</i> | 6.5 6.9 7.1 | 6.83 | ..... | 0.15 | 7.97 | 8.39 |
| | | <i>B'a₂</i> | 15.0 15.3 16.8 | 15.70 | ..... | ..... | ..... | ..... |
| | | <i>C'</i> | 14.1 15.2 14.2 | 14.50 | ..... | ..... | ..... | ..... |
| | | <i>E'a₂</i> | 10.5 12.2 11.7 | 11.47 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 31.8 33.5 33.2 | 32.50 | ..... | ..... | ..... | ..... |
| | | <i>D</i> | 37.2 37.0 36.7 | 36.97 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 43.8 43.9 43.7 | 43.80 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 40.8 38.8 39.8 | 39.80 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 30.8 31.3 30.6 | 30.90 | ..... | ..... | ..... | ..... |
| 21 57 | | <i>b</i> | 23.7 23.2 22.8 | 23.23 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 22.2 21.7 21.5 | 21.80 | ..... | ..... | ..... | ..... |
| 1903 November 10. | | | Good. | | | | | |
| 21 7 | 29 | <i>a</i> | 18.9 18.2 19.0 | 18.70 | 18.49 | 1.51 | 9.70 | 10.12 |
| | | <i>b</i> | 19.6 20.3 20.0 | 19.97 | 19.40 | 1.63 | 9.82 | 10.24 |
| | | <i>g</i> | 26.0 26.4 26.1 | 26.17 | 26.09 | 2.30 | 10.49 | 10.91 |
| | | <i>s</i> | 35.8 36.0 35.3 | 35.70 | 35.42 | 3.23 | 11.42 | 11.84 |
| | | <i>x</i> | 42.0 41.2 41.5 | 41.57 | 41.55 | 3.95 | 12.14 | 12.56 |
| | | <i>m</i> | 30.2 30.3 30.2 | 30.23 | 30.27 | 2.68 | 10.87 | 11.29 |
| | | <i>m</i> | 30.7 30.2 30.0 | 30.30 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 41.7 41.3 41.6 | 41.53 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 36.0 35.2 34.2 | 35.13 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 25.2 26.0 25.8 | 26.00 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 18.8 18.7 19.0 | 18.83 | ..... | ..... | ..... | ..... |
| 21 27 | 32 | <i>a</i> | 18.7 18.3 17.8 | 18.27 | ..... | ..... | ..... | ..... |
| | | <i>Gai</i> | 8.0 9.1 9.0 | 8.70 | ..... | ..... | ..... | ..... |

TABLE 64.—6894 S LYRÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1902 November 3. | | | 40-INCH, WEDGE V. | | | Seeing poor and getting worse. | | |
|-------------------------------|------------|----------|-------------------|----------------------|------------|--------------------------------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | | <i>s</i> | 33.0 33.1 34.9 | 33.67 | 34.17 | 3.10 | 11.57 | 11.99 |
| | | <i>x</i> | 36.0 37.1 36.1 | 36.40 | 39.20 | 3.69 | 12.16 | 12.58 |
| | | <i>z</i> | 44.8 43.8 43.8 | 44.13 | 44.48 | 4.26 | 12.73 | 13.15 |
| | | <i>v</i> | 57.4 56.4 56.4 | 56.73 | 57.18 | 5.35 | 13.82 | 14.24 |
| | | <i>β</i> | 59.2 59.1 58.3 | 58.87 | ..... | 5.43 | 13.90 | 14.32 |
| | | <i>α</i> | 58.6 58.2 58.2 | 58.33 | 58.18 | 5.41 | 13.88 | 14.30 |
| | | <i>α</i> | 58.2 58.7 57.2 | 58.03 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 56.5 56.6 59.8 | 57.63 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 44.8 44.0 45.7 | 44.83 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 41.8 43.2 41.0 | 42.00 | ..... | ..... | ..... | ..... |
| | 23 26 | <i>s</i> | 34.0 35.0 35.0 | 34.67 | ..... | ..... | ..... | ..... |
| 1902 October 31. | | | | | | | | |
| 21 30 | | <i>s</i> | 28.3 30.0 30.3 | 29.53 | 29.20 | 2.57 | 11.66 | 12.08 |
| | | <i>x</i> | 32.2 33.2 33.2 | 32.87 | 33.05 | 2.99 | 12.08 | 12.50 |
| | | <i>z</i> | 37.8 39.4 40.8 | 39.33 | 38.88 | 3.64 | 12.73 | 13.15 |
| | | <i>v</i> | 53.5 52.8 52.3 | 52.87 | 52.74 | 5.05 | 14.14 | 14.56 |
| | | <i>β</i> | 57.2 54.5 55.6 | 55.77 | 53.17 | 5.09 | 14.18 | 14.60 |
| | | <i>α</i> | 53.0 50.8 53.0 | 52.27 | 50.25 | 4.83 | 13.92 | 14.34 |
| | | <i>α</i> | 50.7 46.2 47.8 | 48.23 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 50.2 50.2 51.3 | 50.57 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 53.0 52.5 52.3 | 52.60 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 38.0 39.5 37.8 | 38.43 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 33.7 32.8 33.2 | 33.22 | ..... | ..... | ..... | ..... |
| | 22 0 | <i>s</i> | 28.0 29.2 29.4 | 28.87 | ..... | ..... | ..... | ..... |
| 1902 October 31. Seeing fair. | | | | | | | | |
| 22 28 | | <i>s</i> | 27.0 29.7 31.1 | 29.27 | 31.80 | 2.84 | 11.66 | 12.08 |
| | | <i>x</i> | 32.0 32.8 32.0 | 32.27 | 35.67 | 3.26 | 12.08 | 12.50 |
| | | <i>z</i> | 37.7 38.6 40.0 | 38.77 | 41.20 | 3.91 | 12.73 | 13.15 |
| | | <i>v</i> | 51.7 52.8 52.3 | 52.27 | 54.27 | 5.18 | 14.00 | 14.42 |
| | | <i>β</i> | 56.0 56.7 56.7 | 56.47 | 56.10 | 5.30 | 14.12 | 14.54 |
| | | <i>α</i> | 54.5 55.0 55.2 | 54.90 | 56.15 | 5.30 | 14.12 | 14.54 |
| | | <i>α</i> | 58.2 56.5 57.5 | 57.40 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 55.2 56.0 56.0 | 55.73 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 56.5 57.3 55.0 | 56.27 | ..... | ..... | ..... | ..... |
| | | <i>z</i> | 44.0 43.9 43.0 | 43.63 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 39.5 37.8 39.9 | 39.07 | ..... | ..... | ..... | ..... |
| | 22 28 | <i>s</i> | 33.9 34.0 35.1 | 34.33 | ..... | ..... | ..... | ..... |
| 1904 May 20. Good. | | | | | | | | |
| 14 50 | | <i>α</i> | 45.2 47.4 46.5 | 46.37 | 46.99 | 4.53 | 14.11 | 14.53 |
| | | <i>β</i> | 52.0 53.0 52.9 | 52.63 | 54.57 | 5.20 | 14.78 | 15.20 |
| | | <i>z</i> | 37.0 38.6 37.0 | 37.53 | 37.58 | 3.50 | 13.08 | 13.50 |
| | | <i>x</i> | 28.8 29.7 29.9 | 29.47 | ..... | 2.60 | 12.18 | 12.60 |
| | | <i>z</i> | 38.7 36.9 37.3 | 37.63 | ..... | ..... | ..... | ..... |
| | | <i>β</i> | 55.8 55.9 57.8 | 56.50 | ..... | ..... | ..... | ..... |
| | | <i>α</i> | 48.8 46.8 47.2 | 47.60 | ..... | ..... | ..... | ..... |
| | 17 5 | <i>v</i> | 14.7 14.8 14.1 | 14.53 | ..... | 1.00 | 10.58 | 11.00 |

TABLE 65.—6894 S LYRÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|--------------------|-------------|-----------|------|---------------|-----------|-------------|-----------|------|---------------|-----------|--------------|-----------|------|---------------|-----------|
| Star. | November 7. | | | | | November 8. | | | | | November 24. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | | |
| E'... | 0.01 | 6.86 | 7.28 | -.02 | +.04 | 0.17 | 6.96 | 7.38 | +.08 | +.14 | 0.11 | 6.91 | 7.33 | +.03 | +.09 |
| G'... | 0.62 | 7.47 | 7.89 | +.07 | -.08 | 0.65 | 7.44 | 7.86 | +.04 | -.11 | 0.63 | 7.43 | 7.85 | +.03 | -.12 |
| H'... | 0.27 | 7.12 | 7.54 | +.04 | +.04 | 0.26 | 7.05 | 7.47 | -.11 | -.03 | 0.32 | 7.12 | 7.54 | -.04 | +.04 |
| Means | 0.30 | 7.15 | 7.57 | $\pm .04$ | $\pm .05$ | 0.36 | 7.15 | 7.57 | $\pm .08$ | $\pm .09$ | 0.35 | 7.15 | 7.57 | $\pm .03$ | $\pm .08$ |
| M ₀... | .... | 6.85 | 7.27 | ..... | ..... | .... | 6.79 | 7.21 | ..... | ..... | .... | 6.80 | 7.22 | ..... | ..... |

| 12-INCH. | | | | | 40-INCH. | | | | | |
|----------------------|-----------------|---------|---------|----------|----------------------|------------------|----------|----------|---------|---------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | | |
| | | July 7. | Oct. 5. | Nov. 10. | | | Oct. 31. | Oct. 31. | Nov. 3. | May 20. |
| a..... | 9.71 | 2.41 | 1.80 | 1.51 | g..... | 10.46 | .... | .... | .... | .... |
| b..... | 9.89 | 2.58 | 2.04 | 1.63 | s..... | 11.56 | 2.57 | 2.84 | 3.10 | .... |
| g..... | 10.39 | 3.02 | 2.71 | 2.30 | x..... | 12.18 | 2.99 | 3.26 | 3.69 | 2.60 |
| Mean C. | .... | 2.67 | 2.18 | 1.81 | Mean C... | .... | 2.78 | 3.05 | 3.40 | 2.60 |
| Mean Mag | 10.00 | 10.00 | 10.00 | 10.00 | Mean Mag. | .... | 11.87 | 11.87 | 11.87 | 12.18 |
| M ₀..... | .... | 7.33 | 7.82 | 8.19 | M ₀..... | .... | 9.09 | 8.82 | 8.47 | 9.58 |

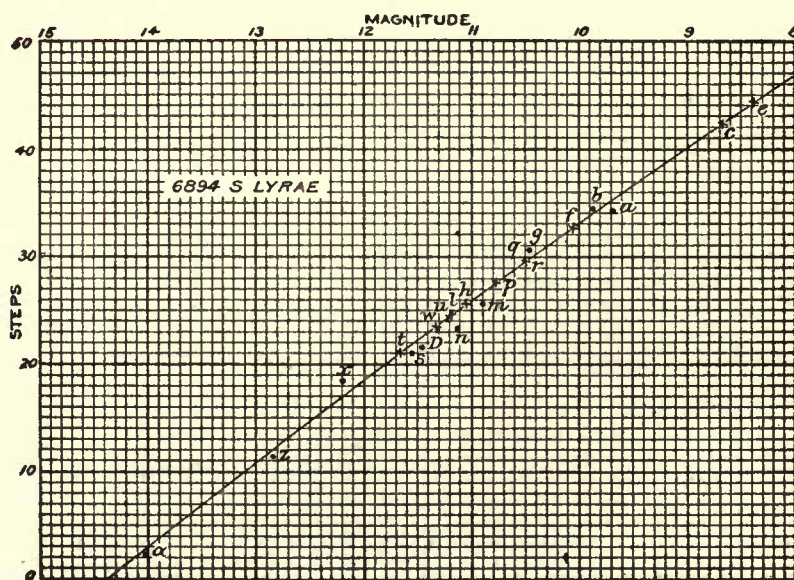


FIG. 22.—MAGNITUDE-CURVE FOR S LYRÆ.

TABLE 67.—6894 S Lyræ. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|-----------|-----------|--|----------------------------|--------|-------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1896 Oct. 7 | .. | 2410000+3840 | 80 | 6 | (a2b, b4f, f2g, g5h, h1k, kl) (g1q, qr, g3p, p2m, mn, no) (o2s, st, limit s and t....) | | <21 | <11.6 | .... | 0 | .... |
| 2 | Nov. 12 | .. | 3876 | 150 | 6 | u1w, u3-4t | | <21 | <11.6 | good | 36 | .... |
| 3 | 26 | 7 | 3890.54 | 150 | 6 | s4x | | <18 | <12.1 | good | ... | .... |
| 4 | Dec. 9 | 6 | 3903.50 | 150 | 6 | s1-2x, difficult | | <18 | <12.1 | moon | ... | .... |
| 5 | 23 | 6 | 3917.50 | 150 | 6 | s1-2x, sv, limit x | | 21.0 | 11.68 | good | 77 | +0.11 |
| 6 | 1897 Jan. 9 | 9 | 3934.63 | 80 | 6 | a4-5v, b5v, v3l, v1h | 29.7, 29.0, 27.6, 26.6. | 28.0 | 10.72 | low | 94 | -0.36 |
| 7 | May 25 | 10 | 4070.67 | 150 | 6 | g5v, v1m. | 25.6, 26.6. | 26.1 | 10.99 | good | 230 | -0.21 |
| 8 | June 11 | 9 | 4087.63 | 150 | 6 | v4s, o1-2v, m2v | 25.0, 24.2, 23.6. | 24.2 | 11.25 | good | 247 | -0.24 |
| 9 | July 1 | 9 | 4107.63 | 150 | 6 | vs, v2x, m6v. | 21.0, 20.4, 19.6. | 20.3 | 11.77 | good | 267 | -0.09 |
| 10 | 16 | 9 | 4122.63 | 150 | 6 | s1v, v2x | 20.0, 20.4. | 20.2 | 11.78 | good | 282 | -0.34 |
| 11 | 26 | 9 | 4132.63 | 150 | 6 | s1v, v1x | 20.0, 19.4. | 19.7 | 11.86 | fair | 292 | -0.46 |
| 12 | Aug. 27 | 8 | 4164.58 | 150 | 6 | x1v, v glimpsed | | 17.4 | 12.15 | fine | 324 | -0.85 |
| 13 | Sept. 17 | 8 | 4185.58 | 80 | 6 | x3-4v±, z1-2v | 14.9, 9.9 | 12.4 | 12.79 | fine | 345 | -0.66 |
| 14 | 22 | 8 | 4190.56 | 150 | 6 | z2-3v, v glimpsed | | 8.9 | 13.25 | fine | 350 | -0.27 |
| 15 | Oct. 25 | 7 | 4223.54 | 150 | 6 | v not seen, limit 1-2 < A | | <19 | <11.9 | good | ... | .... |
| 16 | Nov. 16 | 6 | 4245.50 | 150 | 6 | v not seen, limit z | | <11 | <13.0 | fine | ... | .... |
| 17 | Dec. 29 | 6 | 4288.50 | 150 | 6 | v not seen, limit z | | <11 | <13.0 | good | ... | .... |
| 18 | 1898 Feb. 15 | 17 | 4336.96 | 150 | 6 | v not seen, limit x | | <18 | <12.1 | good | ... | .... |
| 19 | Mar. 2 | 17 | 4351.96 | 150 | 6 | v4z, v2s, D1v, m3-4v | 15.4, 23.0, 20.5, 22.1 | 20.0 | 11.80 | fine | 76 | +0.20 |
| 20 | 23 | 16 | 4372.92 | 150 | 6 | v2m, v1n, v6s, g4v | 27.6, 25.7, 27.0, 26.6 | 26.7 | 10.91 | good | 96 | -0.13 |
| 21 | Apr. 1 | 16 | 4381.92 | 150 | 6 | v6n, v1g, b2v | 30.7, 31.6, 32.3. | 31.5 | 10.20 | good | 106 | -0.59 |
| 22 | 15 | 16 | 4395.92 | 150 | 6 | v2g, b3v | 32.6, 31.3. | 31.9 | 10.17 | good | 120 | -0.31 |
| 23 | May 7 | 10 | 4417.67 | 40 | 6 | a4v, b2v, v2g. | 31.2, 32.3, 32.6. | 32.0 | 10.16 | fair | 141 | -0.05 |
| 24 | 21 | 9 | 4431.63 | 40 150 | 6 6 | b2v, v3g b3v, v2g | 32.3, 33.6. 31.3, 32.6. | 32.4 | 10.09 | fair | 155 | -0.14 |
| 25 | June 14 | .. | 4455 | 80 | 12 | g2v, v1-2m. | 28.6, 27.1. | 27.8 | 10.77 | fair | 179 | +0.30 |
| 26 | 27 | .. | 4468 | 80 | 12 | b4-5v, v2g, limit 3 < z. | 29.8, 32.6. | 31.2 | 10.27 | good | 192 | -0.46 |
| 27 | July 5 | 11 | 4476.71 | 80 | 12 | g4-5v, v2m, c8a, e10a. | 26.1, 27.6. | 26.8 | 10.90 | good | 200 | +0.13 |
| 28 | 18 | 11 | 4489.71 | 80 | 12 | g4v, v1-2m. | 26.6, 27.1. | 26.8 | 10.90 | fair | 213 | -0.07 |
| 29 | Aug. 1 | 10 | 4503.67 | 80 | 12 | g4v, m2v, vn | 26.6, 23.6, 25.6. | 25.2 | 11.10 | moon | 227 | -0.07 |
| 30 | 18 | 10 | 4520.67 | 80 | 12 | m6v, v1s, v4x, limit z. | 19.6, 22.0, 22.4. | 21.3 | 11.62 | fair | 244 | +0.32 |
| 31 | Sept. 7 | 8 | 4540.58 | .. | 6 | m6-8v, s2v, v2x, v4z, limit z. | 18.6, 19.0, 20.4, 15.4 | 18.3 | 12.03 | good | 264 | +0.22 |
| 32 | 20 | 8 | 4553.58 | .. | 6 | v glimpsed, s3-4v | | 17.5 | 12.13 | fair | 277 | +0.10 |
| 33 | Oct. 8 | 7 | 4571.54 | 150 | 6 | s2v, vx, v3z, limit z. | 19.0, 18.4, 14.4. | 17.2 | 12.17 | fine | 295 | -0.23 |
| 34 | Nov. 1 | 6 | 4595.50 | 150 | 6 | z1v, v glimpsed. | | 10.4 | 13.03 | good | 319 | +0.15 |
| 35 | 15 | 7 | 4609.54 | 200 | 6 | v not seen, limit z | | <11 | <13.0 | good | ... | .... |
| 36 | 1899 Mar. 22 | 16 | 4736.92 | .. | 6 | v not seen, limit 1-2 < x. | | <17 | <12.2 | .... | ... | .... |
| 37 | Apr. 21 | 16 | 4766.92 | 200 | 6 | v2-3z, v1x, vs, D3v | 13.9, 19.4, 21.0, 18.5 | 18.2 | 12.05 | good | 54 | -0.25 |
| 38 | May 1 | 10 | 4776.67 | 150 | 6 | s1v, v2x | 20.0, 20.0. | 20.0 | 11.80 | low | 64 | -0.18 |
| 39 | 18 | 10 | 4793.65 | 200 | 6 | v2-3s, D2v, uncertain | 23.5, 19.5. | 21.5 | 11.60 | low | 81 | +0.18 |
| 40 | 29 | 9 | 4804.63 | 150 | 6 | v3s, m1v, v1D. | 24.0, 24.6, 22.5. | 23.7 | 11.32 | good | 92 | +0.15 |
| 41 | June 7 | 10 | 4813.67 | 150 | 6 | v4D, v1m, g4-5v | 25.0, 26.6, 26.1. | 25.7 | 11.05 | low | 101 | +0.15 |
| 42 | 13 | 10 | 4819.65 | 150 | 6 | v2-3m, vg, b4v. | 28.1, 30.6, 30.3. | 29.6 | 10.50 | good | 107 | -0.29 |
| 43 | July 5 | 10 | 4841.67 | 150 | 6 | b3v, v2-3g | 33.3, 33.1. | 33.1 | 9.99 | good | 129 | -0.33 |
| 44 | July 10 | 10 | 4846.65 | 150 | 6 | b4v, v1g | 30.3, 31.6. | 30.9 | 10.31 | good | 134 | +0.04 |
| 45 | 18 | 9 | 4854.61 | 150 | 6 | b4v, v1g | 30.3, 31.6. | 30.9 | 10.31 | moon | 142 | +0.10 |
| 46 | Aug. 5 | 9 | 4872.63 | 150 | 6 | b3v, vg | 31.3, 30.6. | 30.9 | 10.31 | fair | 160 | +0.03 |
| 47 | 10 | 9 | 4877.61 | 150 | 6 | b6v, g2-3v, v4m. | 28.3, 28.1, 29.6. | 28.6 | 10.65 | good | 165 | +0.33 |
| 48 | 26 | 9 | 4893.61 | 150 | 6 | g2v, v3m. | 28.6, 28.6. | 28.6 | 10.65 | good | 181 | +0.15 |
| 49 | Sept. 4 | 9 | 4902.61 | 150 | 6 | g4v, v1m, v6-7s | 26.6, 26.6, 27.5. | 26.9 | 10.89 | good | 190 | +0.29 |
| 50 | 12 | 7 | 4910.54 | 150 | 6 | g4v, vm, v4s | 26.6, 25.6, 25.0. | 25.7 | 11.03 | good | 198 | +0.32 |
| 51 | 26 | 8 | 4924.56 | 150 | 6 | g7-8v, vm, v3-4s | 23.1, 25.6, 24.5. | 24.4 | 11.20 | good | 212 | +0.27 |
| 52 | Oct. 4 | 8 | 4932.56 | 150 | 6 | m2v, v1s | 23.6, 22.0. | 22.8 | 11.42 | poor | 220 | +0.35 |
| 53 | 23 | 7 | 4951.54 | 150 | 6 | m2-3v, v0-1s, v2x. | 23.1, 21.5, 20.4. | 21.6 | 11.59 | good | 239 | +0.26 |

TABLE 67.—6894 S LYRÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | <i>t</i> . | Δ Mag. |
|-----|----------------|---------------|---------------------|----------------|-----------|---|------------------------|--------|-------|---------|------------|---------------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 54 | 1899 Oct. 30 | 6 | 2410000+ | 150 | 6 | <i>m</i> 6 <i>v</i> , <i>vs</i> | 19.6, 21.0..... | 20.3 | 11.77 | fair | 246 | +0.28 |
| 55 | Nov. 6 | 6 | 4958.50 | 150 | 6 | <i>s</i> 2 <i>v</i> , <i>v</i> 0-1 <i>x</i> | 19.0, 18.9..... | 18.9 | 11.96 | good | 253 | +0.34 |
| 56 | 20 | 6 | 4979.50 | ... | 6 | <i>v</i> not seen, limit 2 < <i>s</i> | ... | <19 | <11.9 | ... | ... | ... |
| 57 | 22 | 7 | 4981.54 | 200 | 6 | <i>s</i> 2 <i>v</i> , <i>v</i> 2 <i>x</i> , <i>v</i> 3 <i>z</i> | 19.0, 20.4, 14.4..... | 17.9 | 12.08 | good | 269 | +0.18 |
| 58 | 1900 Feb. 24 | 18 | 5075.98 | 175 | 12 | <i>v</i> suspected, limit 4 < <i>z</i> ... | ... | < 7 | <13.5 | fair | ... | ... |
| 59 | Mar. 2 | 16 | 5081.92 | 275 | 12 | <i>v</i> not held, limit 5 < <i>z</i> ... | ... | < 6 | <13.6 | ... | ... | ... |
| 60 | 22 | 15 | 5101.85 | 350 | 40 | <i>a</i> 2 <i>v</i> , <i>v</i> 1 <i>β</i> | 0.3, 1.0..... | 0.6 | 14.27 | good | 389 | -0.13 |
| 61 | Apr. 4 | 15 | 5114.88 | 275 | 12 | <i>v</i> or <i>a</i> glimpsed, at limit... | ... | 2 | 14.1± | good | ... | ... |
| 62 | 6 | 16 | 5116.92 | 350 | 40 | 28-10 <i>a</i> , <i>a</i> 3-4 <i>β</i> , <i>β</i> 4 <i>v</i> | ... | - 4.0 | 14.87 | fair | 404 | +0.18 |
| 63 | May 2 | 15 | 5142.88 | 460 | 40 | 27-8 <i>a</i> , <i>a</i> 1 <i>β</i> , <i>β</i> 4 <i>v</i> | ... | - 4.0 | 14.87 | fair | 430 | +0.06 |
| 64 | 11 | 14 | 5151.83 | 460 | 40 | <i>a</i> 2 <i>β</i> , <i>β</i> 4 <i>v</i> , 26-8 <i>a</i> | ... | - 4.0 | 14.87 | fair | 3 | +0.10 |
| 65 | 28 | 10 | 5168.67 | 275 | 12 | <i>v</i> not seen, limit 5-6 < <i>z</i> ... | ... | < 6 | <13.6 | good | ... | ... |
| 66 | 29 | 12 | 5169.75 | 237 | 40 | 210 <i>v</i> , <i>v</i> 3 <i>a</i> , <i>a</i> 1-28..... | 1.4, 5.3..... | 3.3 | 13.95 | good | 21 | -0.40 |
| 67 | June 19 | 12 | 5190.75 | 350 | 40 | 24 <i>v</i> , <i>v</i> 6 <i>a</i> , <i>a</i> 3-4 <i>β</i> | 7.4, 8.3..... | 7.8 | 13.39 | poor | 42 | +0.51 |
| 68 | 28 | 10 | 5199.67 | 237 | 40 | <i>x</i> 6 <i>v</i> , <i>v</i> 1 <i>z</i> | 12.4, 12.4..... | 12.4 | 12.78 | good | 51 | +0.38 |
| 69 | Aug. 6 | 9 | 5238.63 | 150 | 6 | <i>m</i> 3 <i>v</i> , <i>v</i> 2 <i>D</i> , <i>v</i> 6 <i>x</i> | 22.6, 23.5, 24.4..... | 23.5 | 11.35 | moon | 90 | +0.15 |
| 70 | 13 | 9 | 5245.63 | 150 | 6 | <i>v</i> 6-7 <i>s</i> , <i>v</i> 3 <i>m</i> , <i>v</i> 4 <i>D</i> , <i>vn</i> | 27.5, 28.6, 25.5, 24.7 | 26.5 | 10.95 | good | 97 | -0.05 |
| 71 | 20 | 8 | 5252.58 | 40 | 6 | <i>v</i> 5 <i>m</i> , <i>vg</i> | 30.6, 30.6..... | 30.6 | 10.35 | poor | 102 | -0.54 |
| 72 | Sept. 5 | 8 | 5268.58 | 40 | 6 | <i>a</i> 3 <i>v</i> , <i>b</i> 1-2 <i>v</i> , <i>v</i> 3 <i>g</i> | 31.2, 32.8, 33.6..... | 32.5 | 10.07 | fair | 120 | -0.42 |
| 73 | 15 | 7 | 5278.54 | 150 | 6 | <i>b</i> 3 <i>v</i> , <i>vg</i> , <i>v</i> 6 <i>m</i> | 33.3, 30.6, 31.6..... | 31.8 | 10.19 | good | 130 | -0.11 |
| 74 | Oct. 26 | 6 | 5319.50 | 150 | 6 | <i>a</i> 3 <i>v</i> , <i>b</i> 1 <i>v</i> , <i>v</i> 1 <i>g</i> , <i>v</i> 6 <i>m</i> | 31.2, 33.3, 31.6, 30.6 | 31.9 | 10.18 | good | 171 | -0.21 |
| 75 | Nov. 21 | 6 | 5345.50 | 150 | 6 | <i>g</i> 4 <i>v</i> , <i>v</i> 4 <i>m</i> | 26.6, 29.6..... | 28.1 | 10.70 | poor | 197 | -0.02 |
| 76 | 1901 Nov. 12 | 7 | 5701.54 | 350 | 40 | <i>g</i> 4-5 <i>v</i> | ... | 26.6 | 10.94 | good | 117 | +0.39 |
| 77 | 1902 Mar. 5 | 16 | 5814.92 | 237 | 40 | <i>m</i> 2 <i>v</i> , <i>v</i> 4 <i>D</i> | 23.6, 25.5..... | 24.6 | 11.19 | fair | 231 | -0.04 |
| 78 | 28 | 14 | 5837.83 | 237 | 40 | <i>v</i> 3 <i>x</i> , <i>vs</i> , <i>v</i> D, <i>m</i> 5 <i>v</i> | 21.4, 21.0, 21.5, 21.6 | 21.4 | 11.60 | good | 253 | -0.02 |
| 79 | May 14 | 13 | 5884.79 | 67 | 12 | <i>v</i> not seen, <i>x</i> seen | ... | <18. | <12.1 | good | ... | ... |
| 80 | July 7 | 10 | 5938.67 | 67 | 12 | 23-4 <i>v</i> , <i>v</i> glimpsed | ... | 7.9 | 13.38 | good | 354 | -0.25 |
| 81 | Oct. 5 | 9 | 6028.63 | 67 | 12 | <i>v</i> not seen, limit <i>z</i> | ... | <11 | <13.0 | good | 8 | ... |
| 82 | 10 | 9 | 6033.63 | 237 | 40 | <i>v</i> a±, <i>v</i> β±..... | 2±, 0± | 1± | 14.2± | moon | 13 | -0.04 |
| 83 | 20 | 8 | 6043.58 | 237 | 40 | photometer..... | ... | ... | 14.02 | fair | 23 | -0.18 |
| 84 | 31 | 7 | 6054.54 | 237 | 40 | { photometer..... } | ... | ... | 14.07 | fair | 34 | +0.77 |
| 85 | Nov. 3 | 8 | 6057.58 | 237 | 40 | photometer..... | ... | ... | 13.82 | poor | 37 | +0.63 |
| 86 | Dec. 1 | .. | 6084 | ... | 24 | photograph | ... | ... | 15.0 | ... | 64 | ... |
| 87 | 23 | 7 | 6107.54 | 237 | 40 | <i>s</i> 2 <i>v</i> , <i>v</i> 2 <i>x</i> | 19.0, 20.4..... | 19.7 | 11.87 | good | 87 | +0.57 |
| 88 | 1903 Oct. 10 | 10 | 6398.67 | 67 | 12 | <i>v</i> not seen, limit 1 < <i>x</i> ... | ... | <17 | <12.2 | moon | 89 | ... |
| 89 | 11 | 7 | 6399.54 | 150 | 6 | <i>v</i> not seen, limit 2 | ... | <11 | <13.0 | good | ... | ... |
| 90 | 13 | 9 | 6401.63 | 80 | 12 | <i>v</i> not seen, limit 1 < <i>z</i> ... | ... | <10 | <13.1 | good | .. | ... |
| 91 | 1904 May 17 | 11 | 6618.71 | 40 | 6 | <i>b</i> 3-4 <i>v</i> , <i>v</i> 2 <i>g</i> | 30.8, 32.6..... | 31.7 | 10.20 | good | 162 | -0.10 |
| 92 | 20 | 9 | 6621.63 | 237 | 40 | photometer..... | ... | ... | 9.74 | good | 165 | -0.58 |
| 93 | Aug. 4 | 8 | 6697.58 | 150 | 6 | <i>s</i> 1 <i>v</i> , <i>v</i> 2-3 <i>x</i> | 20.0, 20.9..... | 20.4 | 11.76 | fair | 241 | +0.25 |
| 94 | 27 | .. | 6720 | 150 | 6 | <i>s</i> 3 <i>v</i> , <i>vx</i> | 18.0, 18.4..... | 18.2 | 12.03 | good | 266 | +0.19 |
| 95 | Sept. 24 | 8 | 6748.58 | ... | 24 | photographs | ... | ... | 14 | fair | 292 | ... |
| 96 | Oct. 8 | 10 | 6762.67 | 237 | 40 | 24 <i>v</i> , <i>v</i> 10-12 <i>a</i> , <i>a</i> 5 <i>β</i> | 7.4, 13.3..... | 9± | 13.2 | fair | 306 | +0.5± |
| 97 | Nov. 30 | 6 | 6815.50 | 40 | 6 | <i>v</i> not seen, limit <i>x</i> | ... | <18 | <12.1 | good | ... | ... |
| 98 | 1905 Jan. 3 | 6 | 6849.50 | 750 | 40 | <i>a</i> 4 <i>β</i> , <i>β</i> 2-3 <i>v</i> , <i>v</i> near limit | ... | -2.5 | 14.67 | fair | 393 | +0.17 |
| 99 | Feb. 14 | 17 | 6891.94 | 750 | 40 | <i>a</i> 3-4 <i>β</i> , <i>β</i> 5-6 <i>v</i> , near limit | ... | -5.5 | 15.05 | fair | 0 | +0.25 |
| 100 | Mar. 12 | 16 | 6917.94 | 750 | 40 | <i>a</i> 4 <i>β</i> , <i>β</i> 4 <i>v</i> | ... | -4.0 | 14.87 | fair | 25 | +0.77 |
| 101 | Apr. 4 | 16 | 6940.92 | { 237 } 750 | 40 | { <i>a</i> 2-3 <i>v</i> , <i>v</i> 1 <i>β</i> } | { -0.2, 1.0..... } | 0.0 | 14.59 | good | 48 | +1.99 |
| | | | | | | { <i>a</i> 4 <i>v</i> , <i>v</i> β..... } | { -1.7, 0.0..... } | | | | | |

TABLE 67.—6894 S LYRÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|-----------------|---------------|----------------------|---------|-----------|--|------------------------|--------|-------|---------|-------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day. G. M. T. | | | | | Steps. | Mag. | | | |
| 102 | 1905 Apr. 11 | 16 | 2410000+ 6947.92 | 750 | 40 | { v_{48} , v_{1^a} , z is $2^M > v...$ } (z_{8v} , v_{4^a} | 4.0, 3.3 | 3.5 | 13.91 | good | 55 | +1.60 |
| 103 | 30 | 14 | 6966.83 | 237 | 40 | z_{8v} , v_{4^a} | 3.4, 6.3 | 5.3 | 13.69 | good | 74 | +2.02 |
| 104 | May 20 | 10 | 6986.67 | 237 | 40 | x_{2v} , v_{3z} | 16.4, 14.4 | 15.4 | 12.40 | good | 94 | +1.31 |
| 105 | June 13 | 14 | 7010.83 | 237 | 40 | $vg \pm$ | 30.6 | 10.34 | good | 118 | -0.17 | |
| 106 | 20 | 12 | 7017.75 | 237 | 40 | b_{2-3v} , v_{2-3g} | 31.8, 33.1 | 32.4 | 10.06 | good | 125 | -0.32 |
| 107 | 24 | 9 | 7021.63 | 80 | 12 | g_{5v} , v_{0-1m} | 25.6, 26.1 | 25.9 | 11.01 | poor | 129 | +0.68 |
| 108 | 26 | 10 | 7023.67 | 80 | 12 | g_{2v} , v_{2-3m} | 28.6, 28.1 | 28.4 | 10.67 | good | 131 | -0.37 |
| 109 | July 23 | 10 | 7050.67 | 237 | 40 | photometer | ... | 10.6± | good | 158 | +0.3± | |
| 110 | 26 | 9 | 7053.63 | 150 | 6 | m_{1v} , v_{2D} , v_{4-5s} | 24.6, 23.6, 25.5 | 24.3 | 11.20 | good | 161 | +0.90 |
| 111 | Aug. 9 | 9 | 7067.63 | 150 | 6 | g_{4v} , v_{3m} | 26.6, 28.6 | 27.6 | 10.79 | good | 175 | +0.37 |
| 112 | 21 | 9 | 7079.63 | ... | 12 | photographs, 213, 214. | ... | <10.5 | fair | 187 | .... |  |
| 113 | 22 | 9 | 7080.6 | ... | 12 | photographs, 215, 216. | ... | 11.7 | good | 188 | +1.1 | |
| 114 | 25 | 10 | 7083.67 | ... | 12 | photographs, 221, 222. | ... | 11.7 | ... | 191 | +1.1 | |
| 115 | 28 | 8 | 7086.59 | 150 | 6 | m_{1v} , v_{3D} , v_{4s} | 24.6, 24.5, 25.0 | 24.7 | 11.16 | good | 194 | +0.46 |
| 116 | Sept. 17 | 7 | 7106.55 | 150 | 6 | m_{2v} , v_{1D} , v_{1-2s} | 23.6, 22.5, 22.5 | 22.9 | 11.41 | good | 214 | +0.42 |
| 117 | Oct. 1 | 10 | 7120.67 | 237 | 40 | s_{2v} , v_{2x} | 19.0, 20.4 | 19.7 | 11.85 | fair | 228 | +0.65 |
| 118 | 20 | 7 | 7139.54 | 80 | 12 | s_{1v} , v_{3x} | 20.0, 21.4 | 20.7 | 11.71 | good | 247 | +0.21 |
| 119 | Nov. 18 | 6 | 7168.50 | 237 | 40 | z_{1v} | ... | 10.4 | 13.05 | good | 276 | +1.02 |

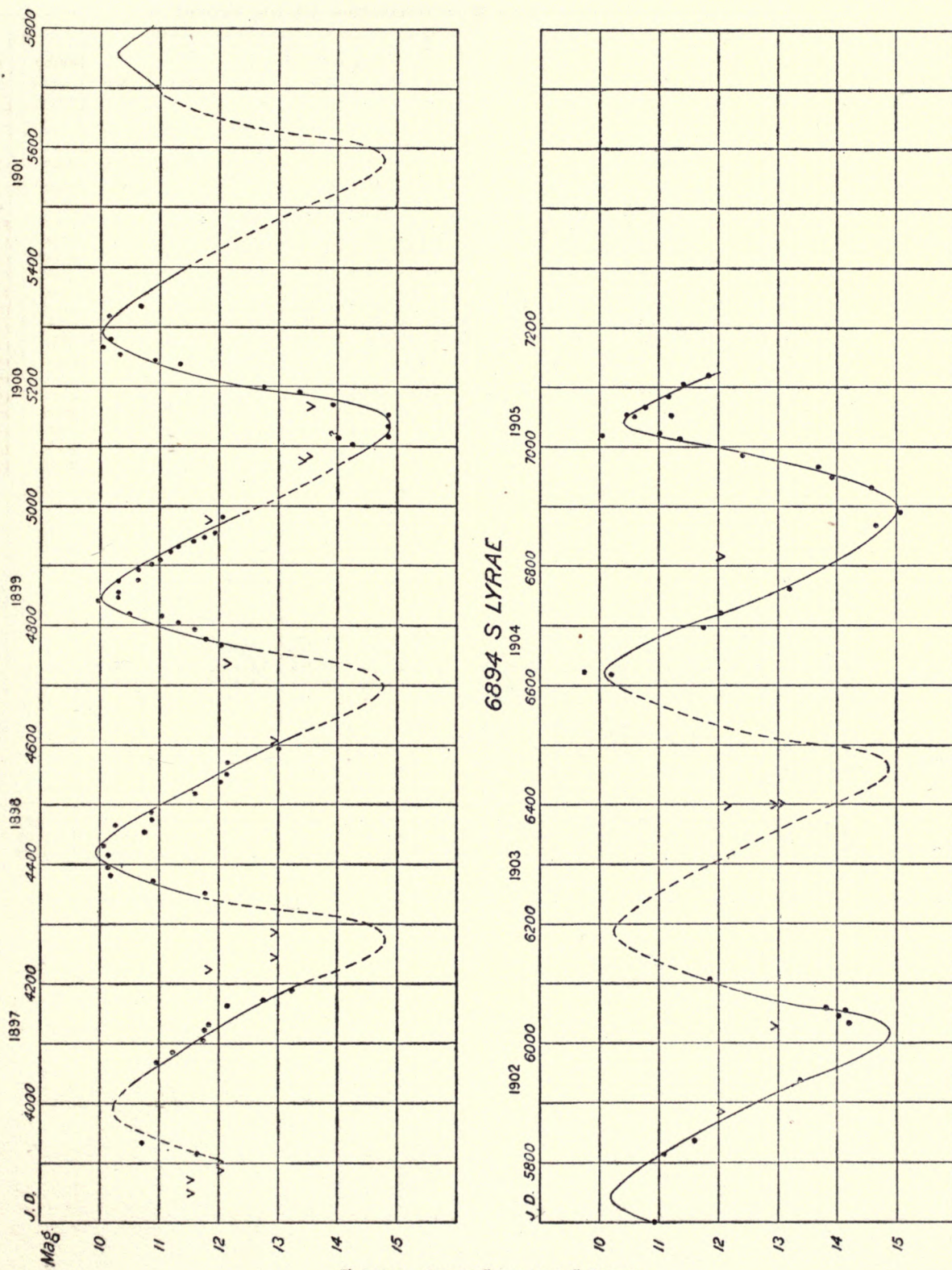


FIG. 23.—LIGHT-CURVE OF S LYRÆ.

TABLE 68.—6894 S LYRÆ. MEAN MAGNITUDES FROM 36½ DAY GROUPS.

| Group No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|----------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D. | 36 | 73 | 109 | 145 | 182 | 218 | 254 | 291 | 327 | 363 | 400 | 436 |
| 3840 { | <i>t</i> | .... | .... | 85 | .... | .... | .... | 238 | 272 | 308 | 348 | .... |
| | <i>M</i> | .... | .... | 11.20 | .... | .... | .... | 11.12 | 11.78 | 12.00 | 13.02 | .... |
| | ΔM | .... | .... | -0.12 | .... | .... | .... | -0.22 | -0.22 | -0.66 | -0.46 | .... |
| | No. | .... | .... | 2 | .... | .... | .... | 2 | 2 | 2 | 2 | .... |
| 4276 { | <i>t</i> | .... | .... | 93 | 130 | 167 | 202 | 236 | 270 | 307 | .... | .... |
| | <i>M</i> | .... | .... | 10.97 | 10.16 | 10.43 | 10.69 | 11.36 | 12.08 | 12.60 | .... | .... |
| | ΔM | .... | .... | -0.17 | -0.18 | -0.08 | -0.13 | +0.12 | +0.16 | -0.04 | .... | .... |
| | No. | .... | .... | 3 | 2 | 2 | 3 | 2 | 2 | 2 | .... | .... |
| 4712 { | <i>t</i> | .... | 59 | 95 | 135 | 169 | 200 | 240 | 269 | .... | .... | 389 |
| | <i>M</i> | .... | 11.92 | 11.12 | 10.20 | 10.54 | 11.04 | 11.68 | 12.08 | .... | .... | 14.27 |
| | ΔM | .... | -0.22 | +0.05 | -0.06 | +0.17 | +0.29 | +0.31 | +0.18 | .... | .... | -0.13 |
| | No. | .... | 2 | 4 | 3 | 3 | 3 | 4 | 1 | .... | .... | 1 |
| 5148 { | <i>t</i> | 12 | 46 | 96 | 125 | 171 | 197 | .... | .... | .... | .... | .... |
| | <i>M</i> | 14.41 | 13.08 | 10.85 | 10.13 | 10.18 | 10.70 | .... | .... | .... | .... | .... |
| | ΔM | -0.15 | +0.44 | -0.15 | -0.26 | -0.21 | -0.02 | .... | .... | .... | .... | .... |
| | No. | 2 | 2 | 3 | 2 | 1 | 1 | .... | .... | .... | .... | .... |
| 5584 { | <i>t</i> | .... | .... | .... | 117 | .... | .... | 242 | .... | .... | 354 | .... |
| | <i>M</i> | .... | .... | .... | 10.94 | .... | .... | 11.40 | .... | .... | 13.38 | .... |
| | ΔM | .... | .... | .... | +0.39 | .... | .... | -0.03 | .... | .... | -0.25 | .... |
| | No. | .... | .... | .... | 1 | .... | .... | 2 | .... | .... | 1 | .... |
| 6020 { | <i>t</i> | 23 | 37 | 87 | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | 14.10 | 13.82 | 11.87 | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | +0.06 | +0.63 | +0.57 | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | 3 | 1 | 1 | .... | .... | .... | .... | .... | .... | .... | .... |
| 6456 { | <i>t</i> | .... | .... | .... | .... | 164 | .... | 241 | 266 | 306 | .... | 393 |
| | <i>M</i> | .... | .... | .... | .... | 9.97 | .... | 11.76 | 12.03 | 13.2± | .... | 14.67 |
| | ΔM | .... | .... | .... | .... | -0.34 | .... | +0.25 | +0.19 | +0.5± | .... | -0.17 |
| | No. | .... | .... | .... | .... | 2 | .... | 1 | 1 | 1 | .... | 1 |
| 6892 { | <i>t</i> | 25 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | 14.87 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | +0.77 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | 1 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Means { | <i>t</i> | 20 | 47 | 91 | 127 | 168 | 200 | 239 | 270 | 307 | 351 | 391 |
| | <i>M</i> | 14.46 | 12.61 | 11.20 | 10.36 | 10.28 | 10.81 | 11.46 | 11.99 | 12.48 | 13.20 | 14.47 |
| | ΔM | +0.13 | +0.21 | -0.03 | -0.10 | -0.06 | +0.07 | +0.11 | +0.04 | -0.26 | -0.39 | +0.02 |
| | No. | 8 | 5 | 13 | 8 | 8 | 7 | 11 | 6 | 5 | 3 | 2 |

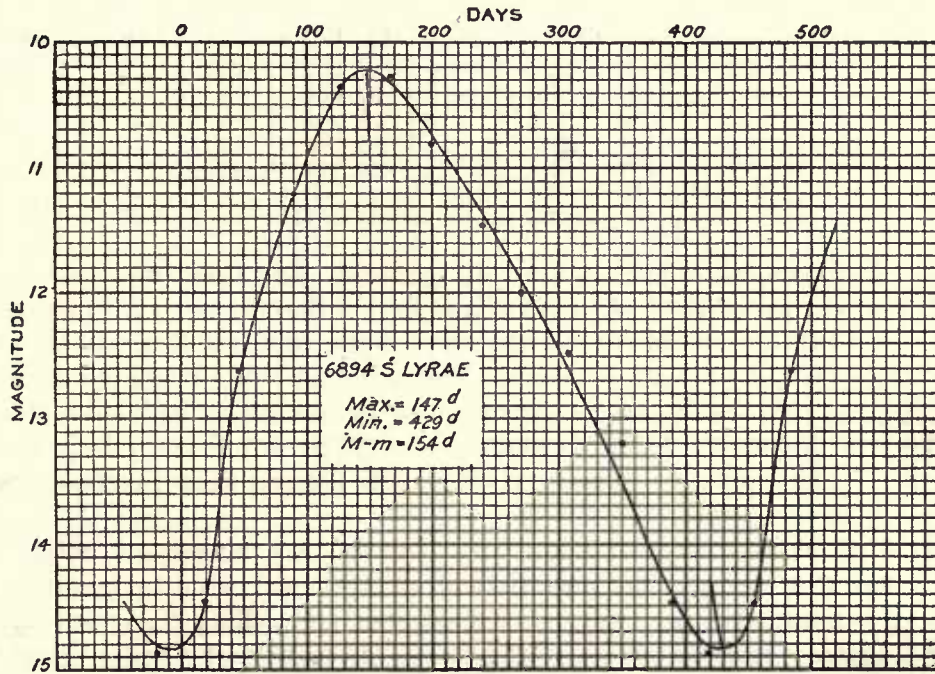


FIG. 24.—MEAN LIGHT-CURVE OF S LYRÆ

TABLE 69.—6894 S Lyræ. OBSERVED MAXIMA AND MINIMA.
 Elements of maximum. 1898 May 12 (J. D. 2414422) + 438^d (E-4). $M-m=15.4^d$

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|---------------|-------|-------|-------|-------|-----|---------|---------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 3 | 1897 Mar. 4 | 3988 | ..... | mc | + 4 | 7 | 4 | 1897 Dec. 19 | 4278 | ..... | mc | + 10 | 6 |
| 4 | 1898 May 12 | 4422 | 9.95 | 10.37 | 0 | 20 | 5 | 1899 Feb. 13 | 4699 | ..... | mc | - 7 | 6 |
| 5 | 1899 July 7 | 4843 | 10.00 | 10.42 | - 17 | 27 | 6 | 1900 Apr. 25 | 5135 | 14.90 | 15.32 | - 9 | 16 |
| 6 | 1900 Sept. 29 | 5292 | 10.04 | 10.46 | - 6 | 9 | 7 | 1901 July 14 | 5580 | ..... | mc | - 2 | 1 |
| 7 | 1901 Dec. 26 | 5745 | ..... | mc | + 9 | 3 | 8 | 1902 Sept. 25 | 6018 | 14.90 | 15.32 | - 2 | 9 |
| 8 | 1903 Mar. 12 | 6186 | ..... | mc | + 12 | 1 | 9 | 1903 Dec. 13 | 6462 | ..... | mc | + 4 | 2 |
| 9 | 1904 May 23 | 6624 | ..... | mc | + 12 | 3 | 10 | 1905 Feb. 18 | 6995 | 15.01 | 15.43 | - 1 | 14 |
| 10 | 1905 July 2 | 7029 | 10.60 | 11.02 | + 21 | 24 | | | | | | | |

The last comparison used in deriving the mean light-curve was that of 1905 March 12. The curve yields a period of 438 days. Several series of observations, covering the maxima between 1895 and 1900, have been published in the *Astronomical Journal*, by H. M. Parkhurst, who noted an "intermediate maximum" 1896 July 14. Probably for this reason the period which had been given as 430 days in Chandler's Third Catalogue, was called 218 days in his "Revised Elements." The present series excludes such intermediate maxima (except that no evidence is furnished for 1901).

A single observation at Bonn, 1856 July 30, 9.5 magnitude, might refer to this star if a correction of one division of the ocular scale be admitted. If so, the star must have been very near maximum, and calling the epoch - 31 the period 436 days results; but as stated above, at present the period is at least 438 days.

Leaving out of account the intermediate maximum in question, the light-curve presents no abnormal features. The total range observed is just about five magnitudes, the different maxima and minima being quite closely accordant. The rise is much faster than the decline, occupying but 35 per cent of the period.

CHAPTER IX.

7220 S CYGNI.

R. A. 20^h 3^m 24^s.7; Dec. + 57° 41' 52" (1900).

This star was discovered at Bonn in 1860 and has been well observed, since Chandler's revised elements depend on 43 maxima and 5 minima, but it does not appear that the minima have ever been completely followed. Townley reports it invisible for two months near minimum in the Madison 15-inch, and in the extended series of observations published in Harvard Annals 37 it was invisible for periods ranging from 70 to 99 days. The photometric measures of comparison stars at Harvard extend only to 13.44, and those by H. M. Parkhurst to 13.48; so that more work was needed in fixing the magnitudes of the fainter comparison stars and following the variable through its minimum. In the Harvard volume above cited the faintest magnitudes noted before and after minimum range from 13.0 to 14.8, and though opportunities for observation when the variable was faint have been few, about a dozen comparisons have been made when it was below the Harvard limit; and photometric magnitudes have been found for the comparison stars down to the faintest used, thus fixing the minimum magnitude of the variable with some precision.

TABLE 70.—7220 S CYGNI. STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color, P. DM. | Magnitude. | | | | Residuals. | | |
|----------|-----------|--|-----------|------------------|------------|--------|-----------|------|------------|------|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P. DM. | H. | P. | H. | P. | |
| | | | | | | | | | | | |
| <i>B</i> | + 57 2106 | <i>h</i> <i>m</i> <i>s</i> 19 56 58 | + 57 32.1 | W | 7.08 | 7.47 | 7.29 | 7.54 | + 21 | + 7 | ± 4 |
| <i>C</i> | + 57 2129 | 20 02 32 | + 57 19.5 | GW | 7.88 | 7.96 | 7.53 | 7.78 | - 35 | - 18 | ± 6 |
| <i>D</i> | + 57 2144 | 20 05 38 | + 57 29.5 | W | 7.04 | 7.32 | 7.17 | 7.42 | + 13 | + 10 | ± 11 |
| Mean... |  | ..... | ..... | ..... | 7.33 | 7.58 | 7.33 | 7.58 | ± 23 | ± 12 | ± 7 |

TABLE 71.—COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|-----------|------|--------------|-----------|----------|-----------|------|--------------|-----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | ° | | <i>h m s</i> | ° ' | | ° | | <i>h m s</i> | ° ' |
| <i>c</i> | + 57 2124 | 8.9 | 20 00 23 | + 57 23.9 | <i>T</i> | + 57 2137 | 9.0 | 20 2 44 | + 57 30.3 |
| <i>d</i> | + 57 2128 | 9.0 | 20 1 18 | + 57 36.0 | <i>g</i> | + 57 2139 | 9.5 | 20 3 20 | + 57 29.0 |
| <i>e</i> | + 57 2130 | 9.3 | 20 2 4 | + 57 31.6 | <i>b</i> | + 57 2149 | 8.1 | 20 6 2 | + 57 53.6 |
| <i>f</i> | + 57 2135 | 8.9 | 20 2 29 | + 57 35.1 | | | | | |

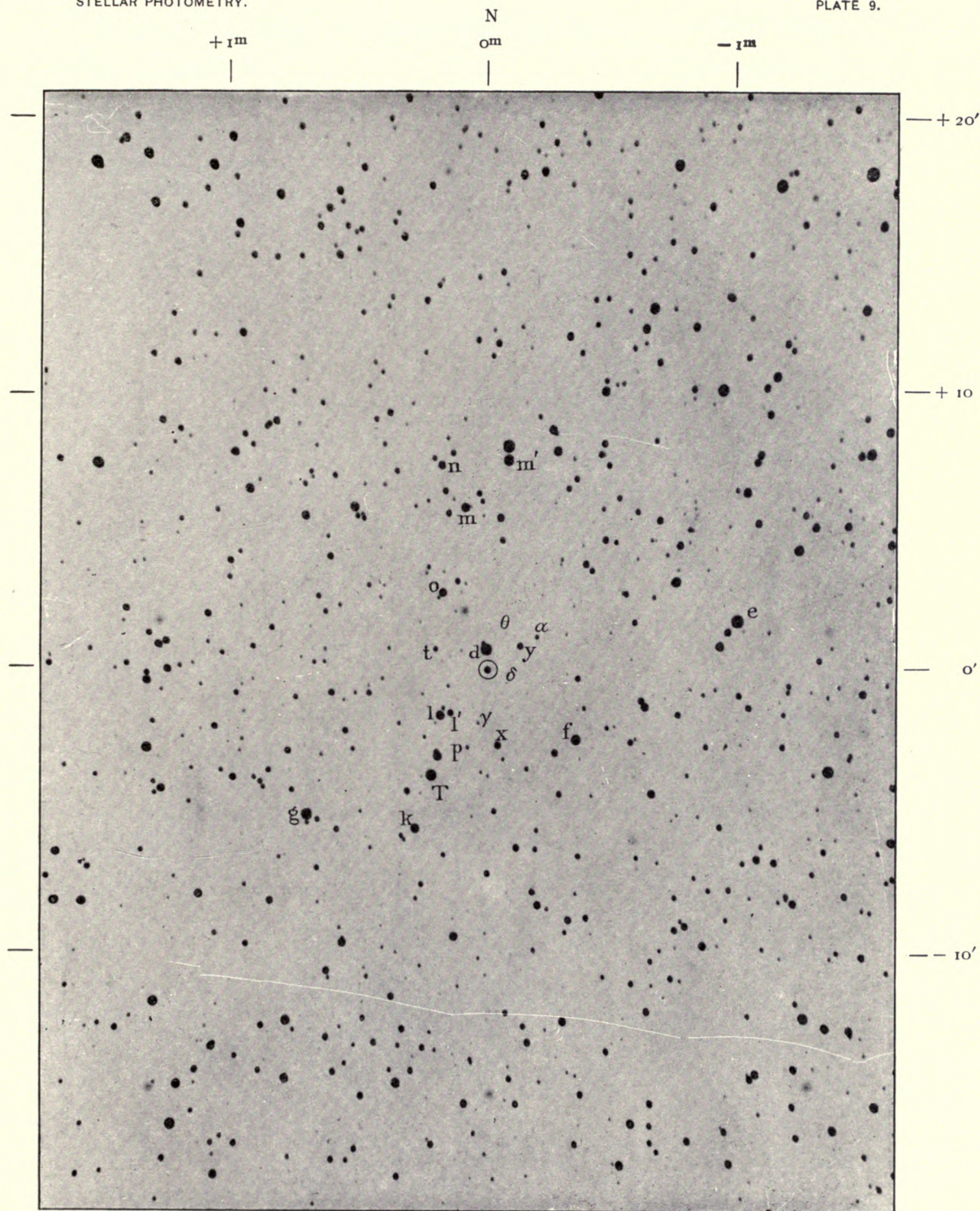
TABLE 72.—COMPARISON STARS FOR S CYGNI (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variables. | | | Light Scale, Steps. | Magnitude. | | | |
|-----------|-----------------------------|--------|-------|---------------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | " | s | | | H. | P. | H. | P. |
| <i>c</i> | -990 | -124.4 | -624 | 39.7 | 8.54 | 8.79 | .... | .... |
| <i>e</i> | -551 | -68.9 | +105 | 36.9 | 9.39 | 9.64 | .... | .... |
| <i>a*</i> | -422 | -52.6 | -1342 | 45.1 | 7.53 | 7.78 | .... | .... |
| <i>f</i> | -194 | -24.2 | -152 | 32.1 | 9.87 | 10.12 | .... | .... |
| <i>a</i> | -109 | -13.4 | +72 | 8.3 | 13.90 | 14.15 | .... | .... |
| <i>y</i> | -74 | -9.3 | +52 | 16.4 | 12.31 | 12.56 | .... | .... |
| <i>m'</i> | -45 | -5.6 | +455 | .... | .... | .... | .... | .... |
| <i>θ</i> | -41 | -5.1 | +80 | 0.3 | 14.94 | 15.19 | .... | .... |
| <i>δ</i> | -39 | -4.4 | -4 | -0.5 | 15.48 | 15.73 | 15.66 | 15.91 |
| <i>x</i> | -22 | -2.8 | -165 | 19.0 | 11.95 | 12.20 | .... | .... |
| <i>d</i> | +3 | +0.3 | +45 | 38.0 | 8.98 | 9.23 | .... | .... |
| <i>η</i> | +8 | +1.0 | +59 | 4.8 | .... | .... | 14.63 | 14.88 |
| <i>γ</i> | +21 | +2.6 | -114 | 4.6 | 14.34 | 14.59 | .... | .... |
| <i>p</i> | +35 | +4.4 | -170 | 21.8 | .... | .... | 11.43 | 11.68 |
| <i>m</i> | +49 | +6.1 | +461 | 24.1 | 10.73 | 10.98 | .... | .... |
| <i>l'</i> | +82 | +10.3 | -94 | .... | .... | .... | .... | .... |
| <i>o</i> | +98 | +12.3 | +168 | 22.0 | 11.32 | 11.57 | .... | .... |
| <i>n</i> | +100 | +12.5 | +445 | 23.6 | .... | .... | 11.12 | 11.37 |
| <i>l</i> | +105 | +13.1 | -100 | 25.7 | 10.53 | 10.78 | .... | .... |
| <i>t</i> | +105 | +13.1 | +45 | 10.6 | 12.8± | 13.1± | 13.5± | 13.7± |
| <i>T</i> | +125 | +15.6 | -230 | .... | 8.86 | 9.11 | .... | .... |
| <i>k</i> | +162 | +20.3 | -347 | 28.7 | .... | .... | 10.20 | 10.45 |
| <i>g</i> | +400 | +50.0 | -314 | 33.2 | .... | .... | 9.59 | 9.84 |

*a = c of Table 71.

TABLE 73.—7220 S CYGNI, PHOTOMETER MEASURES OF COMPARISON STARS.

| 1904 September 3. | | | | 6-INCH. | | | Good. | | |
|--------------------|------------|----------|-----------------|----------------------|------------|------|------------|------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> 21 0 | 19 | <i>B</i> | 10.0 9.7 9.8 | 9.83 | 10.17 | 0.30 | 7.23 | 7.48 | |
| | | <i>C</i> | 12.2 11.7 11.5 | 11.80 | 12.02 | 0.51 | 7.44 | 7.69 | |
| | | <i>c</i> | 20.2 20.0 20.2 | 20.13 | 20.88 | 1.69 | 8.62 | 8.87 | |
| | | <i>e</i> | 24.9 25.6 25.3 | 25.27 | 26.90 | 2.39 | 9.32 | 9.57 | |
| | | <i>f</i> | 30.8 29.9 30.3 | 30.33 | 30.67 | 2.77 | 9.70 | 9.95 | |
| | | <i>d</i> | 24.2 24.3 24.4 | 24.30 | 24.80 | 2.12 | 9.05 | 9.30 | |
| | | <i>T</i> | 24.0 24.5 23.9 | 24.13 | 25.00 | 2.13 | 9.05 | 9.31 | |
| | | <i>D</i> | 11.7 10.8 10.9 | 11.13 | 11.17 | 0.40 | 7.33 | 7.58 | |
| | | <i>D</i> | 11.2 11.2 11.2 | 11.20 | .... | .... | .... | .... |  |
| | | <i>T</i> | 26.2 25.3 26.1 | 25.87 | .... | .... | .... | .... |  |
| | | <i>d</i> | 25.3 25.4 25.2 | 25.30 | .... | .... | .... | .... |  |
| | | <i>f</i> | 31.0 31.0 31.0 | 31.00 | .... | .... | .... | .... |  |
| | | <i>e</i> | 28.7 28.3 28.6 | 28.53 | .... | .... | .... | .... |  |
| | | <i>c</i> | 22.1 21.8 21.0 | 21.63 | .... | .... | .... | .... |  |
| | | <i>C</i> | 12.7 12.5 11.5 | 12.23 | .... | .... | .... | .... |  |
| | | <i>B</i> | 10.0 10.8 10.7 | 10.50 | .... | .... | .... | .... |  |
| 21 21 | 21 | | | | | | | | |



Scale, 1 mm = 13."3.

S

1902 November 24

7220 S CYGNI.

R. A. 20^h 3^m 24^s.7. Dec. +57° 41' 52", 1900.

TABLE 73.—7220 S CYGNI PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 September 5. | | | 6-INCH. | | | Good, somewhat dull. | | |
|---------------------|------------|-----------------------|-----------------|----------------------|------------|----------------------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 19 30 | ° 17 | <i>D</i> _a | 13.8 14.3 14.9 | 14.33 | ..... | 0.87 | 7.83 | 8.08 |
| | | <i>T</i> | 23.2 23.0 22.0 | 22.73 | ..... | 2.00 | 8.96 | 9.21 |
| | | <i>d</i> | 24.0 23.0 23.5 | 23.50 | 24.24 | 2.06 | 9.02 | 9.27 |
| | | <i>f</i> | 31.1 30.8 30.8 | 30.90 | 31.30 | 2.84 | 9.80 | 10.05 |
| | | <i>e</i> | 26.0 26.6 26.9 | 26.50 | 25.79 | 2.22 | 9.18 | 9.43 |
| | | <i>c</i> | 20.0 19.9 20.4 | 20.10 | 20.62 | 1.66 | 8.62 | 8.87 |
| | | <i>C</i> | 13.2 12.5 13.3 | 13.00 | 13.05 | 0.65 | 7.61 | 7.86 |
| | 16 | <i>B</i> | 10.3 10.7 10.2 | 10.40 | 10.54 | 0.34 | 7.30 | 7.55 |
| | | <i>B</i> | 11.1 10.1 10.8 | 10.67 | ..... | ..... | ..... | ..... |
| | | <i>C</i> | 13.3 13.2 12.8 | 13.10 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 20.7 21.5 21.2 | 21.13 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 24.9 25.3 25.0 | 25.07 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 31.4 31.9 31.8 | 31.70 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 24.9 25.0 25.0 | 24.97 | ..... | ..... | ..... | ..... |
| 1904 October 1. | | | Good. | | | | | |
| 21 33 | 21 | <i>D</i> | 8.8 9.7 9.2 | 9.23 | 9.33 | 0.22 | 7.10 | 7.35 |
| | | <i>T</i> | 23.9 23.9 24.8 | 24.20 | 23.69 | 2.01 | 8.89 | 9.14 |
| | | <i>d</i> | 25.1 26.2 25.8 | 25.70 | 25.09 | 2.14 | 9.02 | 9.27 |
| | | <i>f</i> | 32.9 32.9 32.9 | 32.90 | 32.35 | 2.98 | 9.86 | 10.11 |
| | | <i>e</i> | 26.8 27.7 27.1 | 27.20 | 27.49 | 2.40 | 9.28 | 9.53 |
| | | <i>c</i> | 21.6 21.1 21.2 | 21.30 | 20.79 | 1.68 | 8.56 | 8.81 |
| | | <i>C</i> | 12.9 13.2 13.2 | 13.10 | 13.24 | 0.67 | 7.55 | 7.80 |
| | | <i>B</i> | 11.0 11.5 11.1 | 11.20 | 11.47 | 0.45 | 7.33 | 7.58 |
| | | <i>B</i> | 11.8 11.7 11.7 | 11.73 | ..... | ..... | ..... | ..... |
| | | <i>C</i> | 13.7 13.4 13.0 | 13.37 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 20.0 19.8 21.0 | 20.27 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 27.9 27.8 27.6 | 27.77 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 31.3 32.2 31.9 | 31.80 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 24.3 24.9 24.2 | 24.47 | ..... | ..... | ..... | ..... |
| | | <i>T</i> | 22.8 23.1 23.6 | 23.17 | ..... | ..... | ..... | ..... |
| 21 53 | 24 | <i>D</i> | 9.8 9.3 9.2 | 9.43 | ..... | ..... | ..... | ..... |
| 1904 August 13. | | | 12-INCH. | | | Good. | | |
| 17 48 | 26 | <i>c</i> | 17.2 17.5 16.8 | 17.17 | 17.59 | 1.41 | 8.42 | 8.67 |
| | | <i>e</i> | 25.5 26.3 26.4 | 26.07 | 27.07 | 2.37 | 9.38 | 9.63 |
| | | <i>f</i> | 32.0 31.7 31.8 | 31.83 | 31.98 | 2.85 | 9.86 | 10.11 |
| | | <i>x</i> | 53.5 54.6 54.2 | 54.10 | 54.12 | 5.16 | 12.17 | 12.42 |
| | | <i>T</i> | 24.2 23.0 22.5 | 23.23 | 22.35 | 1.96 | 8.97 | 9.22 |
| | | <i>l</i> | 38.2 39.0 38.6 | 38.60 | 37.97 | 3.55 | 10.56 | 10.81 |
| | | <i>v</i> | 39.7 40.6 39.7 | 40.00 | ..... | 3.78 | 10.79 | 11.04 |
| | | <i>d</i> | 22.5 23.9 23.1 | 23.17 | 22.99 | 2.02 | 9.03 | 9.28 |
| | | <i>o</i> | 43.8 44.7 45.0 | 44.50 | 45.17 | 4.35 | 11.36 | 11.61 |
| | | <i>m</i> | 40.7 41.5 41.0 | 41.07 | 40.99 | 3.88 | 10.89 | 11.14 |
| | | <i>m</i> | 40.9 41.1 40.7 | 40.90 | ..... | ..... | ..... | ..... |
| | | <i>o</i> | 45.2 46.6 45.7 | 45.82 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 23.4 23.1 21.9 | 22.80 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 36.7 37.5 37.8 | 37.33 | ..... | ..... | ..... | ..... |
| | | <i>T</i> | 22.0 22.1 20.3 | 21.47 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 53.5 55.0 53.9 | 54.13 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 32.0 32.6 31.8 | 32.13 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 27.9 28.2 28.1 | 28.07 | ..... | ..... | ..... | ..... |
| 18 14 | 22 | <i>c</i> | 18.6 18.2 17.2 | 18.00 | ..... | ..... | ..... | ..... |

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 October 28. | | | 12-INCH. | | | | Good. | |
|------------------|------------|----------|-------------------|----------------------|------------|-------|-------------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3 | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | <i>m</i> | | | | | | |
| 22 8 | 24 | <i>o</i> | 30.3 30.9 30.8 | 30.67 | 31.07 | 2.76 | 10.71 | 10.96 |
| | | <i>d</i> | 36.5 37.1 36.3 | 36.63 | 36.75 | 3.40 | 11.35 | 11.60 |
| | | <i>l</i> | 12.9 14.1 13.3 | 13.43 | 14.25 | 0.95 | 8.90 | 9.15 |
| | | <i>T</i> | 29.6 29.7 29.1 | 29.47 | 29.54 | 2.61 | 10.56 | 10.81 |
| | | <i>x</i> | 12.4 12.7 13.0 | 12.70 | 13.34 | 0.83 | 8.78 | 9.03 |
| | | <i>f</i> | 41.7 41.4 41.6 | 41.57 | 41.59 | 3.95 | 11.90 | 12.15 |
| | | <i>e</i> | 21.3 22.7 21.8 | 21.93 | 22.50 | 1.97 | 9.92 | 10.17 |
| | | <i>c</i> | 17.8 18.3 19.0 | 18.37 | 18.27 | 1.49 | 9.44 | 9.69 |
| | | <i>c</i> | 12.5 11.8 12.0 | 12.10 | 11.87 | 0.64 | 8.59 | 8.84 |
| | | <i>e</i> | 11.5 11.4 12.0 | 11.63 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 18.0 18.3 18.2 | 18.17 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 23.1 22.8 23.3 | 23.07 | ..... | ..... | ..... | ..... |
| | | <i>T</i> | 41.2 41.5 42.1 | 41.60 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 14.0 14.2 13.7 | 13.97 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 30.3 29.4 29.1 | 29.60 | ..... | ..... | ..... | ..... |
| | | <i>o</i> | 14.7 15.3 15.2 | 15.07 | ..... | ..... | ..... | ..... |
| 22 30 | 27 | <i>m</i> | 36.5 37.2 36.9 | 36.87 | ..... | ..... | ..... | ..... |
| | | | 31.8 31.7 30.9 | 31.47 | ..... | ..... | ..... | ..... |
| 1904 October 31. | | | Good, dull. | | | | | |
| <i>o</i> 14 | 40 | <i>m</i> | 29.0 28.9 28.8 | 28.90 | 28.57 | 2.52 | 10.60 | 10.85 |
| | | <i>o</i> | 35.2 34.2 34.7 | 34.70 | 34.82 | 3.17 | 11.25 | 11.50 |
| | | <i>d</i> | 14.8 14.1 14.0 | 14.30 | 14.10 | 0.94 | 9.02 | 9.27 |
| | | <i>l</i> | 26.1 27.8 26.9 | 26.60 | 27.09 | 2.38 | 10.46 | 10.71 |
| | | <i>T</i> | 12.2 12.0 12.1 | 12.10 | 12.54 | 0.75 | 8.83 | 9.08 |
| | | <i>x</i> | 39.3 38.8 39.1 | 39.07 | 39.19 | 3.69 | 11.77 | 12.02 |
| | | <i>f</i> | 20.0 20.3 20.0 | 20.10 | 20.32 | 1.74 | 9.82 | 10.07 |
| | | <i>e</i> | 16.1 16.2 16.8 | 16.37 | 16.67 | 1.28 | 9.36 | 9.61 |
| | | <i>c</i> | 10.9 11.7 10.3 | 10.97 | 10.77 | 0.53 | 8.61 | 8.86 |
| | | <i>c</i> | 10.7 10.8 10.2 | 10.57 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 16.9 16.7 17.3 | 16.97 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 21.1 20.3 20.2 | 20.53 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 39.6 39.4 38.9 | 39.30 | ..... | ..... | ..... | ..... |
| | | <i>T</i> | 12.2 13.7 13.0 | 12.97 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 27.5 27.4 27.8 | 27.57 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 14.9 13.9 12.9 | 13.90 | ..... | ..... | ..... | ..... |
| | | <i>o</i> | 35.5 35.0 34.3 | 34.93 | ..... | ..... | ..... | ..... |
| <i>o</i> 37 | 43 | <i>m</i> | 28.0 28.6 28.1 | 28.23 | ..... | ..... | ..... | ..... |
| 1900 August 30. | | | 40-INCH WEDGE II. | | | | Low, seeing poor. | |
| <i>1</i> 40 | | <i>y</i> | 30.5 32.8 31.6 | 31.63 | ..... | 3.05 | 12.40 | 12.65 |
| | | <i>a</i> | 46.5 50.5 48.3 | 48.43 | ..... | 4.84 | 14.19 | 14.44 |
| | | <i>x</i> | 26.8 25.2 27.1 | 26.37 | ..... | 2.43 | 11.77 | 12.03 |
| | | <i>o</i> | 22.8 23.7 26.5 | 24.33 | ..... | 2.16 | 11.51 | 11.76 |
| <i>2</i> 20 | | <i>m</i> | 18.0 20.7 18.4 | 19.03 | ..... | 1.35 | 10.70 | 10.95 |

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1900 September 13. | | | 40-INCH, WEDGE II | | | | Good. | | |
|--------------------|------------|----------|-------------------|----------------------|---------------------------------------|-------|------------|-------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | ° | | | | | | | | |
| 21 27 | | <i>m</i> | 15.7 17.0 14.9 | 15.87 | 15.89 | 0.82 | 10.48 | 10.73 | |
| | | <i>o</i> | 22.3 21.9 22.4 | 22.20 | 21.74 | 1.77 | 11.43 | 11.68 | |
| | | <i>a</i> | 42.6 42.8 43.0 | 42.80 | 42.64 | 4.23 | 13.89 | 14.14 | |
| | | <i>y</i> | 30.9 31.0 31.8 | 31.23 | 30.77 | 2.94 | 12.60 | 12.85 | |
| | | <i>v</i> | 38.5 38.0 40.0 | 38.83 | ..... | 3.80 | 13.46 | 13.71 | |
| | | <i>l</i> | 15.8 14.0 14.2 | 14.67 | 14.22 | 0.59 | 10.25 | 10.50 | |
| | | <i>x</i> | 26.1 24.2 25.2 | 25.17 | 25.74 | 2.33 | 11.99 | 12.24 | |
| | | <i>x</i> | 26.5 25.2 27.2 | 26.30 | ..... | ..... | ..... | ..... |  |
| | | <i>l</i> | 15.1 13.2 13.0 | 13.77 | ..... | ..... | ..... | ..... |  |
| | | <i>y</i> | 28.2 31.8 30.9 | 30.30 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 42.5 41.9 43.0 | 42.47 | ..... | ..... | ..... | ..... |  |
| | | <i>o</i> | 21.9 20.5 21.4 | 21.27 | ..... | ..... | ..... | ..... |  |
| | | 22 6 | | <i>m</i> | 16.9 15.5 15.3 | 15.90 | | | |
| 1902 November 3. | | | WEDGE V. | | Poor, occasionally fair for a moment. | | | | |
| 0 55 | | <i>n</i> | 31.8 32.9 33.6 | 32.77 | 34.60 | 3.15 | 11.24 | 11.49 | |
| | | <i>m</i> | 28.7 29.6 30.2 | 29.50 | 29.22 | 2.57 | 10.66 | 10.91 | |
| | | <i>o</i> | 38.4 38.5 38.0 | 38.30 | 37.20 | 3.45 | 11.54 | 11.79 | |
| | | <i>t</i> | 49.5 49.3 50.0 | 49.60 | 49.65 | 4.77 | 12.86 | 13.11 | |
| | | <i>a</i> | 58.6 59.8 59.4 | 59.27 | 59.02 | 5.45 | 13.54 | 13.79 | |
| | | <i>y</i> | 41.3 41.8 42.3 | 41.80 | 40.87 | 3.86 | 11.95 | 12.20 | |
| | | <i>v</i> | 18.4 19.0 19.2 | 18.87 | 19.00 | 1.59 | 9.68 | 9.93 | |
| | | <i>x</i> | 38.2 40.3 40.1 | 39.53 | 39.22 | 3.69 | 11.78 | 12.03 | |
| | | <i>l</i> | 25.3 26.1 25.7 | 25.70 | 26.10 | 2.30 | 10.39 | 10.64 | |
| | | <i>l</i> | 26.3 26.9 26.3 | 26.50 | ..... | ..... | ..... | ..... |  |
| | | <i>x</i> | 39.0 38.5 39.2 | 38.90 | ..... | ..... | ..... | ..... |  |
| | | <i>v</i> | 18.6 19.0 19.8 | 19.13 | ..... | ..... | ..... | ..... |  |
| | | <i>y</i> | 39.8 40.2 39.8 | 39.93 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 56.8 59.8 59.7 | 58.77 | ..... | ..... | ..... | ..... |  |
| | | <i>t</i> | 48.4 50.8 49.9 | 49.70 | ..... | ..... | ..... | ..... |  |
| | | <i>o</i> | 36.2 35.8 36.3 | 36.10 | ..... | ..... | ..... | ..... |  |
| | | <i>m</i> | 28.2 30.2 28.4 | 28.93 | ..... | ..... | ..... | ..... |  |
| | | | <i>n</i> | 36.9 36.2 36.2 | 36.43 | | | | |
| 1905 January 3. | | | Good. | | | | | | |
| 1 35 | | <i>m</i> | 14.8 15.8 15.3 | 15.30 | 15.68 | 1.15 | 10.67 | 10.92 | |
| | | <i>o</i> | 21.4 22.4 22.4 | 22.07 | 22.84 | 2.01 | 11.53 | 11.78 | |
| | | <i>a</i> | 45.6 47.2 47.7 | 46.50 | 46.12 | 4.45 | 13.97 | 14.22 | |
| | | <i>y</i> | 32.9 31.7 30.7 | 31.77 | 30.52 | 2.76 | 12.28 | 12.53 | |
| | | <i>o</i> | 57.1 57.7 58.0 | 57.60 | 58.40 | 5.42 | 14.94 | 15.19 | |
| | | <i>v</i> | 58.1 58.4 58.0 | 58.17 | 58.54 | 5.43 | 14.95 | 15.20 | |
| | | <i>y</i> | 51.3 49.1 50.7 | 50.37 | 50.12 | 4.82 | 14.34 | 14.59 | |
| | | <i>x</i> | 24.2 25.1 25.3 | 24.87 | 25.72 | 2.27 | 11.79 | 12.04 | |
| | | <i>x</i> | 27.0 26.0 26.7 | 26.57 | ..... | ..... | ..... | ..... |  |
| | | <i>y</i> | 49.0 50.4 50.2 | 49.87 | ..... | ..... | ..... | ..... |  |
| | | <i>v</i> | 58.5 59.8 58.4 | 58.90 | ..... | ..... | ..... | ..... |  |
| | | <i>o</i> | 59.3 59.3 59.0 | 59.20 | ..... | ..... | ..... | ..... |  |
| | | <i>y</i> | 28.4 30.1 29.3 | 29.27 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 45.0 46.2 46.0 | 45.73 | ..... | ..... | ..... | ..... |  |
| | | <i>o</i> | 23.1 23.7 24.0 | 23.60 | ..... | ..... | ..... | ..... |  |
| | | | | 15.0 16.7 16.5 | 16.07 | | | | |
| | | 1 54 | 54 | | | | | | |

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1905 November 18. | | | 40-INCH, WEDGE V. | | | | Good. | | |
|--------------------|------------|----------|-------------------|----------------------|------------|-------|------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> 6 30 | | <i>x</i> | 19.3 20.1 20.0 | 19.80 | 19.25 | 1.62 | 11.95 | 12.20 | |
| | | <i>y</i> | 42.0 42.8 44.2 | 43.00 | 42.10 | 4.01 | 14.34 | 14.59 | |
| | | <i>z</i> | 54.1 56.6 53.1 | 54.60 | 54.04 | 5.15 | 15.48 | 15.73 | |
| | | <i>y</i> | 21.0 20.7 20.7 | 20.80 | 20.86 | 1.80 | 12.13 | 12.38 | |
| | | <i>a</i> | 40.5 40.1 40.1 | 40.43 | 39.76 | 3.75 | 14.08 | 14.33 | |
| | | <i>o</i> | 15.5 15.9 15.8 | 15.73 | 15.36 | 1.16 | 11.49 | 11.74 | |
| | | <i>t</i> | 33.6 32.1 32.8 | 32.83 | 32.46 | 2.90 | 13.23 | 13.48 | |
| | | <i>t</i> | 32.1 32.0 32.2 | 32.10 | ..... | ..... | ..... | ..... |  |
| | | <i>o</i> | 14.0 15.7 15.3 | 15.00 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 36.8 41.3 39.8 | 39.30 | ..... | ..... | ..... | ..... |  |
| | | <i>y</i> | 20.8 20.9 21.1 | 20.93 | ..... | ..... | ..... | ..... |  |
| | | <i>z</i> | 52.1 53.7 54.6 | 53.47 | ..... | ..... | ..... | ..... |  |
| | | <i>y</i> | 39.9 42.3 41.4 | 41.20 | ..... | ..... | ..... | ..... |  |
| 6 50 | | <i>x</i> | 18.7 18.3 19.1 | 18.70 | ..... | ..... | ..... | ..... |  |

TABLE 74.—7220 S CYGNI. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|-----------------------------|-------------------|-----------|------|---------------|-----------|-------------------|-----------|------|---------------|-----------|-----------------|-----------|------|---------------|-----------|
| Star. | 1904 September 3. | | | | | 1904 September 5. | | | | | 1904 October 1. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| <i>B</i> | 0.30 | 7.23 | 7.48 | + .15 | + .01 | 0.34 | 7.30 | 7.55 | + .22 | + .08 | 0.45 | 7.33 | 7.58 | + .25 | + .11 |
| <i>C</i> | 0.51 | 7.44 | 7.69 | — .44 | — .27 | 0.65 | 7.61 | 7.86 | — .27 | — .10 | 0.67 | 7.55 | 7.80 | — .33 | — .16 |
| <i>D</i> | 0.40 | 7.33 | 7.58 | + .29 | + .26 | 0.12 | 7.08 | 7.33 | + .04 | + .01 | 0.22 | 7.10 | 7.35 | + .06 | + .03 |
| Means | 0.40 | 7.33 | 7.58 | \pm .29 | \pm .18 | 0.37 | 7.33 | 7.58 | \pm .18 | \pm .06 | 0.45 | 7.33 | 7.58 | \pm .21 | \pm .10 |
| <i>M</i> ₀..... | ..... | 6.93 | 7.18 | ..... | ... | ..... | 6.96 | 7.21 | ..... | ..... | ..... | 6.88 | 7.13 | ..... | ..... |

| 12-INCH. | | | | | 40-INCH. | | | | | |
|-----------------------------|-----------------|----------|----------|----------|-----------------------------|------------------|---------|---------|----------|-----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | | |
| | | Aug. 13. | Oct. 28. | Oct. 31. | | | Nov. 3. | Jan. 3. | Aug. 30. | Sept. 13. |
| <i>c</i> | 8.60 | 1.41 | 0.64 | 0.53 | <i>l</i> | 10.53 | ..... | ..... | ..... | 0.59 |
| <i>d</i> | 9.03 | 2.02 | 0.95 | 0.94 | <i>m</i> | 10.73 | 2.57 | 1.15 | 1.35 | 0.82 |
| <i>e</i> | 9.26 | 2.37 | 1.49 | 1.28 | <i>o</i> | 11.32 | 3.45 | 2.01 | 2.16 | 1.77 |
| <i>f</i> | 9.79 | 2.85 | 1.97 | 1.74 | <i>x</i> | 11.95 | 3.69 | 2.27 | 2.43 | 2.33 |
| <i>T</i> | 8.97 | 1.96 | 0.83 | 0.75 | | | | | | |
| Mean C... | ..... | 2.12 | 1.18 | 1.05 | Mean C... | ..... | 3.24 | 1.81 | 1.98 | 1.47 |
| Mean Mag. | 9.13 | 9.13 | 9.13 | 9.13 | Mean Mag. | 11.13 | 11.33 | 11.33 | 11.33 | 11.13 |
| <i>M</i> ₀..... | ..... | 7.01 | 7.95 | 8.08 | <i>M</i> ₀..... | ..... | 8.09 | 9.52 | 9.35 | 9.66 |

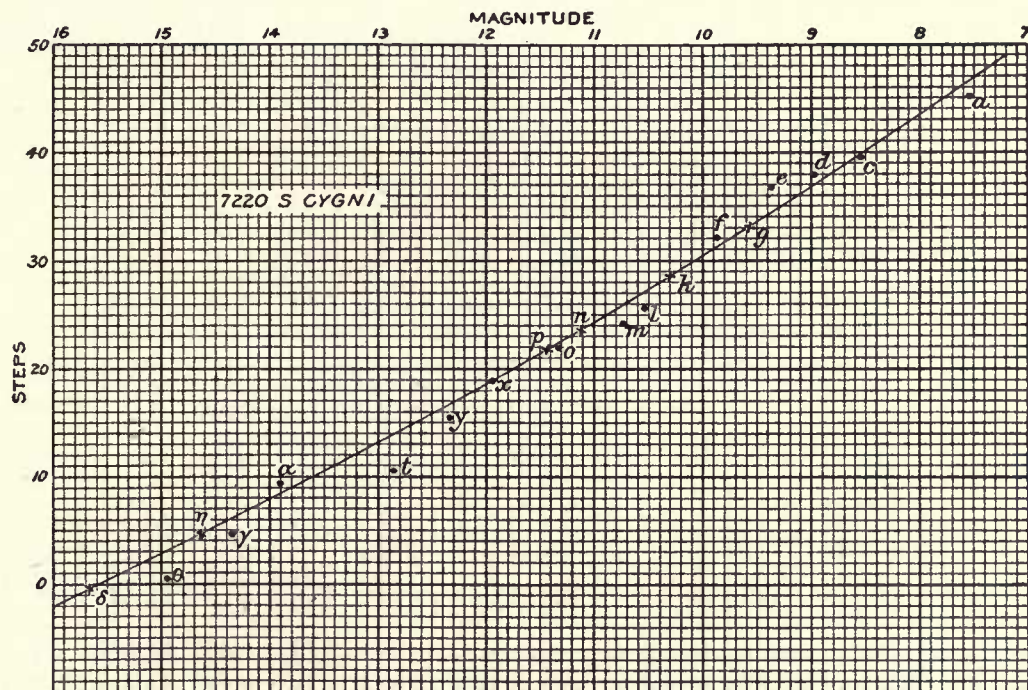


FIG. 25.—MAGNITUDE-CURVE FOR S CYGNI.

TABLE 75.—7220 S CYGNI. MEAN MAGNITUDES OF COMPARISON STARS.

| 6-INCH. | | | | | | | | | | |
|----------|--------------|---------------|---------------|---------------|-------------|---------------|------------|---------------|---------------|---------|
| Star. | September 3. | | September 5. | | October 1. | | Mean. | | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. | |
| <i>B</i> | 7.23 | -0.06 | 7.30 | +0.01 | 7.33 | +0.04 | 7.29 | 7.54 | ± 0.04 | |
| <i>C</i> | 7.44 | -0.09 | 7.61 | +0.08 | 7.55 | +0.02 | 7.53 | 7.78 | ± 0.06 | |
| <i>D</i> | 7.33 | +0.16 | 7.08 | -0.09 | 7.10 | -0.07 | 7.17 | 7.42 | ± 0.11 | |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | 7.33 | 7.58 | ± 0.07 | |
| <i>c</i> | 8.62 | +0.02 | 8.62 | +0.02 | 8.56 | -0.04 | 8.60 | 8.85 | ± 0.03 | |
| <i>d</i> | 9.05 | +0.02 | 9.02 | -0.01 | 9.02 | -0.01 | 9.03 | 9.28 | ± 0.01 | |
| <i>e</i> | 9.32 | +0.06 | 9.18 | -0.08 | 9.28 | +0.02 | 9.26 | 9.51 | ± 0.05 | |
| <i>f</i> | 9.70 | -0.09 | 9.80 | +0.01 | 9.86 | +0.07 | 9.79 | 10.04 | ± 0.06 | |
| <i>T</i> | 9.06 | +0.09 | 8.96 | -0.01 | 8.89 | -0.08 | 8.97 | 9.22 | ± 0.06 | |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | 9.13 | 9.38 | ± 0.04 | |
| 12-INCH. | | | | | | | | | | |
| Star. | August 13. | | October 28. | | October 31. | | Mean. | | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. | |
| <i>c</i> | 8.42 | -0.12 | 8.59 | +0.05 | 8.61 | +0.07 | 8.54 | 8.79 | ± 0.08 | |
| <i>d</i> | 9.03 | +0.05 | 8.90 | -0.08 | 9.02 | +0.04 | 8.98 | 9.23 | ± 0.06 | |
| <i>e</i> | 9.38 | -0.01 | 9.44 | +0.05 | 9.36 | -0.03 | 9.39 | 9.64 | ± 0.03 | |
| <i>f</i> | 9.86 | -0.01 | 9.92 | +0.05 | 9.82 | -0.05 | 9.87 | 10.12 | ± 0.04 | |
| <i>T</i> | 8.97 | +0.11 | 8.78 | -0.08 | 8.83 | -0.03 | 8.86 | 9.11 | ± 0.07 | |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | 9.13 | 9.38 | ± 0.06 | |
| <i>l</i> | 10.56 | +0.03 | 10.56 | +0.03 | 10.46 | -0.07 | 10.53 | 10.78 | ± 0.04 | |
| <i>m</i> | 10.89 | +0.16 | 10.71 | -0.02 | 10.60 | -0.13 | 10.73 | 10.98 | ± 0.10 | |
| <i>o</i> | 11.36 | +0.04 | 11.35 | +0.03 | 11.25 | -0.07 | 11.32 | 11.57 | ± 0.05 | |
| <i>x</i> | 12.17 | +0.22 | 11.90 | -0.05 | 11.77 | -0.18 | 11.95 | 12.20 | ± 0.15 | |
| Mean. | ..... | ..... | ..... | ..... | ..... | ..... | 11.13 | 11.38 | ± 0.08 | |
| 40-INCH. | | | | | | | | | | |
| Star. | August 30. | | September 13. | | November 3. | | January 3. | | Mean. | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. |
| <i>l</i> | | | 10.25 | -0.07 | 10.39 | +0.07 | | .. | 10.32 | 10.57 |
| <i>m</i> | 10.70 | +0.07 | 10.48 | -0.15 | 10.66 | +0.03 | 10.67 | +0.04 | 10.63 | 10.88 |
| <i>o</i> | 11.51 | +0.01 | 11.43 | -0.07 | 11.54 | +0.04 | 11.53 | +0.03 | 11.50 | 11.75 |
| <i>x</i> | 11.77 | -0.06 | 11.99 | +0.16 | 11.78 | -0.05 | 11.79 | -0.04 | 11.83 | 12.08 |
| Mean. | | | | | | | | | 11.07 | 11.32 |
| <i>y</i> | 12.40 | +0.09 | 12.60 | +0.29 | 11.95 | -0.36 | 12.28 | -0.03 | 12.31 | 12.56 |
| <i>a</i> | 14.19 | +0.29 | 13.89 | -0.01 | 13.54 | -0.36 | 13.97 | +0.07 | 13.90 | 14.15 |
| <i>t</i> | | | | | 12.86 | | | | (12.86 | 13.11 |
| <i>θ</i> | | | | | | | 14.94 | | (14.94 | 15.19 |
| <i>γ</i> | | | | | | | 14.34 | | (14.34 | 14.59 |

Also δ , 1905 November 18, 15.48 and 15.73.

TABLE 76.—7220 S CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | d Mag. |
|-----|-----------------|---------------|---------------------|---------|-----------|--|-----------------------------------|--------|-------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1892 Dec. 14 | 9 | 2410000+ 2447.63 | 60 | 6 | $v\frac{1}{2}$ to 1^M fainter than d . . . . . | ..... | .... | 9.5 | poor | 0 | -0.74 |
| 2 | 1893 Jan. 7 | 7 | 2471.52 | ... | 6 | { $m4v, v2l$, limit p} | 21.1, 27.7 | 23.9 | 11.06 | .... | 24 | +0.31 |
| 3 | July 2 | 10 | 2647.67 | ... | 6 | { $n2m, d3e, e4f, g1f, f3h$ . . .} | ..... | <22 | >11.5 | .... | 200 | .... |
| 4 | 3 | 10 | 2648.67 | ... | 6 | v not seen, p easy . . . . . | ..... | <22 | <11.5 | .... | 201 | .... |
| 5 | Aug. 3 | 9 | 2679.63 | ... | 6 | { $e2f, g1f, f3h, h4k, k1l$ . . . .} | ..... | <22 | <11.5 | good | ... | .... |
| 6 | 11 | 9 | 2683.61 | ... | 6 | v not seen, $a3b, b2c, c1d, d2e$ . . . | ..... | <22 | <11.5 | .... | ... | .... |
| 7 | 17 | 10 | 2689.66 | 150 | 6 | { $l2o, p$ not seen, m and $n=f$ . . .} | ..... | <20 | <12 | .... | ... | .... |
| 8 | Sept. 4 | 8 | 2711.58 | 150 | 6 | v not seen, o easy, limit p . . . | ..... | 19.2 | 11.92 | fair | 264 | +0.19 |
| 9 | 6 | 9 | 2713.60 | 150 | 6 | $p2-3v, vx$, limit v | 19.8, 19.0 | 19.4 | 11.89 | .... | 266 | +0.19 |
| 10 | 13 | 8 | 2720.58 | 150 | 6 | $p2v, vx$ | 19.8, 20.0 | 19.9 | 11.80 | .... | 273 | +0.28 |
| 11 | 26 | 8 | 2733.58 | 150 | 6 | $vp, o1v, v2x$ | 21.8, 21.0, 21.0 | 21.3 | 11.52 | .... | 286 | +0.36 |
| 12 | Oct. 4 | 8 | 2741.56 | 40 | 6 | $v1p, l1v, l2p, o$ not seen | 22.8, 24.7 | 23.8 | 11.27 | .... | 294 | +0.31 |
| 13 | 10 | 8 | 2737.56 | 40 | 6 | { $g2f, f3h, h4k$ . . . . .} | ..... | 26.7 | 10.63 | fine | 300 | -0.02 |
| 14 | 21 | 7 | 2758.52 | 40 | 6 | { $a4b, b3c, c2d, d2e, e3f, e1g$. . .} | 30.1, 30.6 | 30.4 | 10.03 | good | 311 | -0.28 |
| 15 | 29 | 6 | 2766.50 | 150 | 6 | { $n2o, pn, p4-5q$, limit q} | 29.1, 30.6 | 29.8 | 10.14 | good | 319 | -0.08 |
| 16 | Nov. 3 | 7 | 2771.51 | 150 | 6 | { $f3h, h2k, k2l, l2m, m3n$} | 27.6, 30.6 | 29.1 | 10.23 | good | 324 | +0.01 |
| 17 | 6 | 8 | 2774.60 | 150 | 6 | { vl , or $vil, k1v, v2m$} | $f4v, v2h$ | 29.4 | 10.19 | fine | 0 | -0.05 |
| 18 | 9 | 6 | 2777.52 | 40 | 6 | { $a4b, b1c, c2d, d2e, e4f, g1f$ . . .} | ..... | 29.4 | 10.19 | fair | 3 | -0.09 |
| 19 | 14 | 8 | 2782.56 | 150 | 6 | { $f4h, h1k, l2k, k3m, m2n$} | 28.6, 28.7, 29.1, 27.2} | 28.2 | 10.40 | fair | 8 | +0.07 |
| 20 | 16 | 7 | 2784.54 | 150 | 6 | { $n2o, o1p$, limit p} | { $f3v, h1v, vk, vil$} | 28.8 | 10.30 | moon | 10 | -0.07 |
| 21 | 20 | 7 | 2788.54 | 150 | 6 | { p poor $p1o, o2q$, limit q, r . . .} | 28.1, 29.6, 29.7, 27.7} | 27.7 | 10.46 | moon | 14 | 0.00 |
| 22 | 25 | 6 | 2793.50 | 150 | 6 | not seen | 26.7, 28.7, 27.6} | 26.8 | 10.60 | fair | 19 | 0.00 |
| 23 | 29 | 6 | 2797.51 | 150 | 6 | { $f3v, v1h, v2k, v2-3l$} | 25.7, 27.7, 26.6, 27.1} | 26.2 | 10.70 | good | 23 | -0.02 |
| 24 | Dec. 1 | 8 | 2799.58 | 150 | 6 | $a3b, b2c, c1d, d7e$, limit e} | 25.7, 26.7, 26.1, 26.1} | 26.5 | 10.65 | poor | 25 | -0.15 |
| 25 | 3 | 7 | 2801.54 | 150 | 6 | { $vl, k1v, v2m$} | 25.2, 27.7, 26.6, 26.1} | 26.4 | 10.66 | fine | 27 | -0.21 |
| 26 | 5 | 6 | 2803.51 | 150 | 6 | $lo-1v, k1v, h2v, v2m$ | 24.2, 26.1 | 25.2 | 10.88 | fine | 29 | -0.05 |
| 27 | 8 | 6 | 2806.50 | 150 | 6 | $l1-2v, v2m$ | 23.7, 23.1, 25.0} | 23.9 | 11.08 | good | 32 | +0.03 |
| 28 | 12 | 6 | 2810.49 | 150 | 6 | $l2v, m1v, v3o$, limit $1-2 < q$. . . | 23.2, 23.1, 25.0} | 23.8 | 11.10 | good | 36 | -0.19 |
| 29 | 17 | 7 | 2815.55 | 150 | 6 | $l3-4v, m1-2v, v1-2o$ | 22.2, 22.6, 23.5} | 22.8 | 11.27 | good | 41 | -0.25 |
| 30 | 28 | 7 | 2826.54 | 150 | 6 | $vx =$ limit . . . . . | ..... | 19.0 | 11.95 | fair | 52 | -0.14 |
| 31 | 1894 Jan. 10 | 7 | 2839.52 | ... | 6 | x seen, v not seen . . . . . | ..... | <19 | <12.0 | fair | ... | .... |
| 32 | June 6 | 10 | 2986.67 | 150 | 6 | v not seen, limit x . . . . . | ..... | <19 | <12.0 | good | ... | .... |
| 33 | 20 | 10 | 3000.67 | 150 | 6 | v not seen, limit $2 < x$ . . . . . | ..... | <17 | <12.3 | fine | ... | .... |
| 34 | 24 | 10 | 3004.67 | 150 | 6 | v glimpsed, $x2-3v$ . . . . . | ..... | 16.5 | 12.38 | good | 230 | -0.19 |
| 35 | 28 | 10 | 3008.67 | 150 | 6 | v glimpsed, $x3v$ . . . . . | ..... | 16.0 | 12.48 | good | 234 | +0.03 |
| 36 | July 2 | 10 | 3012.67 | 150 | 6 | v not held, limit $2 < x, x2y$ . . . . | ..... | <17.0 | <12.3 | good | ... | .... |
| 37 | 8 | 9 | 3018.63 | 150 | 6 | $x2v, vy$, uncertain | 17.0, 16.4 | 16.7 | 12.35 | good | 244 | +0.18 |
| 38 | 23 | 10 | 3033.67 | ... | 6 | $x2v, y1v$, limit v | 17.0, 15.4 | 16.2 | 12.46 | fair | 259 | +0.63 |
| 39 | 29 | 9 | 3039.63 | 150 | 6 | $xo-1v, v1-2y$ | 18.5, 17.9 | 18.2 | 12.10 | good | 265 | +0.39 |
| 40 | Aug. 6 | 9 | 3047.63 | 150 | 6 | $l4-5v, v2-3x$ | 21.2, 21.5 | 21.3 | 11.51 | good | 273 | -0.02 |
| 41 | 8 | 9 | 3049.63 | 150 | 6 | $l5v, v2x$ | 20.7, 21.0 | 20.8 | 11.61 | fair | 275 | +0.11 |
| 42 | 18 | 9 | 3059.63 | 150 | 6 | $l2v, v1-2o$ | 23.7, 23.5 | 23.6 | 11.13 | fair | 285 | -0.12 |
| 43 | 20 | 9 | 3061.63 | 150 | 6 | $l2v, v2-3o$ | 23.7, 24.5 | 24.1 | 11.05 | fair | 287 | +0.14 |

TABLE 76.—7220 S CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | <i>t</i> . | <i>d</i> Mag. |
|-----|---------------------------|---------------|----------------------|---------|-----------|---|------------------------|--------|--------|---------|------------|---------------|
| | Month and Day. | Hour C. S. T. | Julian Day, G. M. T. | | | | | Steps. | Mag. | | | |
| 44 | 1895 June 4 | 9 | 2410000+ 3349.63 | 150 | 6 | <i>v</i> glimpsed, <i>vx</i> ..... | ..... | 19.0 | 11.95 | good | 248 | -0.11 |
| 45 | 13 | 9 | 3358.63 | 150 | 6 | <i>v4x</i> , <i>l1-2v</i> | 23.0, 24.2 | 23.6 | 11.12 | good | 257 | -0.75 |
| 46 | 20 | 9 | 3365.63 | 150 | 6 | <i>v5-6x</i> ..... | ..... | 24.5 | 10.97 | good | 264 | -0.78 |
| 47 | 1898 June 25 | 11 | 4466.71 | 80 | 12 | <i>x4y</i> , <i>y1v</i> , <i>w2y</i> ..... | ..... | 15.4 | 12.57 | .... | 57 | +0.24 |
| 48 | July 6 | 10 | 4477.67 | 275 | 12 | <i>y2v</i> , limit <i>v</i> ..... | ..... | 14.4 | 12.75 | poor | 68 | -0.13 |
| 49 | 25 | 11 | 4496.71 | 275 | 12 | { <i>y8v</i> , limit <i>i</i> < <i>v</i> } angle <i>ydv</i> is a right angle | ..... | 8.4 | 13.90 | good | 87 | +0.19 |
| 50 | Aug. 8 | 10 | 4510.67 | 275 | 12 | <i>y8v</i> , limit <i>v</i> ..... | ..... | 8.4 | 13.90 | good | 101 | -0.21 |
| 51 | 20 | 9 | 4522.63 | 275 | 12 | <i>v</i> not seen, limit 3-4 < <i>y</i> .. | ..... | < 13 | < 13.0 | fair | ... | .... |
| 52 | 1900 June 28 | .. | 5199 | 237 | 40 | { <i>y10v</i> , <i>β4y</i> , <i>v1a</i> , <i>v1y</i> } <i>δ</i> is 16 magnitude, <i>ε</i> is 17 magnitude. | 6.4, 7.9, 10.4, 6.7 .. | 7.8 | 14.02 | .... | 136 | -0.51 |
| 53 | July 20 | 12 | 5221.75 | 237 | 40 | <i>y7a</i> , <i>a4-5v</i> , limit <i>v</i> ..... | ..... | 4.9 | 14.60 | fine | 158 | +0.15 |
| 54 | Aug. 16 | 10 | 5248.67 | 460 | 40 | <i>δ</i> (is it <i>δ</i> or <i>v</i>) limit ..... | ..... | < 0 | < 15.6 | fair | 207 | .... |
| 55 | 29 | .. | 5261 | ... | .. | <i>a5-6v</i> , <i>v2-3δ</i> , <i>η0-1v</i> | 2.8, 2.0, 4.3 | 3.0 | 14.99 | .... | 207 | +1.19 |
| 56 | 30 | .. | 5262 | ... | .. | <i>v</i> is < <i>a</i> ..... | ..... | < 9 | < 13.9 | poor | ... | .... |
| 57 | Sept. 12 | 10 | 5275 | 75 | 12 | (photometer ..... | ..... | < 15 | < 12.7 | moon | ... | .... |
| 58 | 12 | | | | | <i>v</i> not seen, limit 4 < <i>x</i> , (<i>y</i> glimpsed ..... | ..... |  |  |  |  |  |
| 59 | 13 |  |  |  |  | ..... | ..... |  |  |  |  |  |
| 60 | 13 | 10 | 5276.67 | 237 | 40 | <i>y5v</i> , <i>vα</i> , <i>v5γ</i> (<i>t</i> = <i>a</i> ±) | 11.4, 9.4, 9.8 | 10.2 | 13.52 | good | 213 | +0.23 |
| 61 | Oct. 4 | 10 | 5297.67 | 237 | 40 | <i>x3-4v</i> , <i>v2y</i> | 15.5, 18.4 | 17.0 | 12.30 | fair | 234 | -0.13 |
| 62 | ..... | 10 | 5309.67 | 460 | 40 | { <i>v1y</i> , <i>x2-3v</i> , <i>y1l</i> , <i>a6y</i> , <i>γ4δ</i> , } limit <i>δ</i> . | 17.4, 16.5 | 17.0 | 12.30 | fair | 246 | +0.21 |
| 63 | 16 | 10 | 5319.50 | 150 | 6 | { <i>o4v</i> , <i>x1v</i> , <i>v1y</i> , limit <i>y</i> ... } <i>l</i> is 11th mag. or brighter, (<i>l'</i> is 11½m.) | 18.0, 18.0, 17.4 | 17.8 | 12.18 | fine | 253 | +0.23 |
| 64 | 26 | 6 | 5345.50 | 150 | 6 | <i>m4v</i> , <i>o1v</i> , <i>v3x</i> | 20.1, 21.0, 22.0 | 21.0 | 11.59 | fair | 282 | +0.24 |
| 65 | Nov. 21 | 6 | 5345.50 | 150 | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 66 | 1901 Oct. 18 | .. | 5666 | ... | 12 | <i>vl</i> ..... | ..... | 25.7 | 10.79 | good | 276 | -0.70 |
| 67 | 1902 Mar. 15 | 16 | 5824.92 | 237 | 40 | <i>a3v</i> , <i>vθ</i> | 6.4, 2.3 | 4.4 | 14.68 | poor | 107 | +0.46 |
| 68 | Oct. 29 | 10 | 6052.67 | 75 | 12 | <i>f2v</i> , <i>vl</i> | 30.1, 25.7 | 27.9 | 10.37 | fair | 8 | +0.04 |
| 69 | .. | .. | ..... | .. | .. | photometer ..... | ..... |  |  |  |  |  |
| 70 | 30 | .. | 6053.67 | 75 | 12 | photometer ..... | ..... |  |  |  |  |  |
| 71 | 31 | 9 | 6054.63 | 237 | 40 | <i>a2v</i> , <i>γ</i> near limit ..... | ..... | ..... | ..... | ..... | 9 | -0.04 |
| 72 | Nov. 3 | 9 | 6056.63 | 237 | 40 | photometer ..... | ..... | ..... | 9.68 | poor | 12 | -0.72 |
| 73 | 19 | 8 | 6072.58 | 75 | 12 | photometer ..... | ..... | ..... | 11.03 | good | 28 | +0.13 |
| 74 | 24 | 9 | 6077.63 | .. | 24 | photograph ..... | ..... | ..... | 11.9 | good | 33 | .... |
| 75 | Dec. 26 | 7 | 6110.54 | 237 | 40 | <i>y1-2v</i> , <i>v4l</i> | 14.9, 14.6 | 14.8 | 12.70 | .... | 66 | -0.10 |
| 76 | 1903 Jan. 17 | 6 | 6132.50 | 460 | 40 | <i>y8v</i> , <i>l1v</i> , <i>v2a</i> , <i>v6-8v</i> | 8.4, 9.6, 11.4, 12.7 | 10.5 | 13.50 | fair | 88 | -0.27 |
| 77 | Mar. 20 | 17 | 6194.96 | 237 | 40 | <i>v</i> not seen, limit <i>a</i> ..... | ..... | < 9 | < 13.8 | .... | ... | .... |
| 78 | Apr. 3 | 14 | 6208.83 | 237 | 40 | <i>v</i> not seen, limit <i>δ</i> , <i>γ</i> and <i>θ</i> seen. | ..... | < 0 | < 15.6 | .... | ... | .... |
| 79 | 1904 ¹ July 27 | 10 | 6689.67 | ... | 24 | photograph ..... | ..... | ..... | 10.5 | fair | ... | .... |
| 80 | 31 | 12 | 6695.75 | ... | .. | <i>v4l</i> ..... | ..... | 29.7 | 10.16 | good | 322 | -0.06 |
| 81 | Aug. 27 | 8 | 6720.58 | ... | .. | <i>m6v</i> , <i>v10</i> , <i>v6x</i> | 18.1, 23.0, 25.0 | 22.4 | 11.30 | good | 22 | +0.61 |
| 82 | Sept. 3 | 10 | 6727.67 | 40 | 6 | <i>o1-2v</i> , <i>v1x</i> | 20.5, 20.0 | 20.2 | 11.71 | good | 29 | +0.80 |
| 83 | Oct. 1 | 9 | 6755.63 | 40 | 6 | <i>v</i> not seen, <i>x</i> seen ..... | ..... | < 19 | < 12.0 | good | .. | .... |
| 84 | 8 | 9 | 6762.63 | 237 | 40 | <i>y5v</i> , <i>v1l</i> | 11.4, 11.6 | 11.5 | 13.32 | fair | 64 | +0.62 |

TABLE 76.—7220 S CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | <i>t</i> . | <i>J</i> Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|--|------------------------|--------|--------|---------|------------|---------------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 85 | 1904 Oct. 28 | .. | 2410000+ 6782 | 67 | 12 | <i>v</i> not seen, limit <i>y</i> ..... | ..... | < 16.4 | < 12.4 | good | ... | .... |
| 86 | Nov. 6 | 11 | 6791.71 | 237 | 40 | <i>a2v</i> , <i>v1v</i> , <i>v6δ</i> | 7.4, 6.7, 5.5 | 6.5 | 14.29 | fair | 93 | +0.34 |
| 87 | 1905 Jan. 3 | 6 | 6849.50 | 237 | 40 | <i>a8v</i> , <i>v3θ</i> , <i>v3δ</i> | 1.4, 3.3, 2.5 | 2.6 | 15.00 | good | 151 | +0.49 |
| 88 | 3 | 7 | 6849.54 | 237 | 40 | photometer ..... | ..... |  |  |  |  |  |
| 89 | 24 | 6 | 6870.50 | 450 | 40 | <i>v</i> not seen, a glimpsed ..... | ..... | < 6 | < 14.4 | dull | ... | .... |
| 90 | 28 | 7 | 6874.52 | 450 | 40 | <i>t8-10v</i> , <i>v3-4α</i> , <i>v6γ</i> | 6.1, 11.4, 8.7 | 8.7 | 13.87 | good | 176 | -0.28 |
| 91 | Feb. 14 | 16 | 6891.92 | 250 | 40 | <i>y6-7v</i> , <i>v1t</i> | 9.9, 11.6 | 11.1 | 13.39 | good | 193 | -0.41 |
| 92 | Mar. 24 | 17 | 6929.95 | 150 | 6 | <i>o3-4v</i> , <i>v1x</i> | 19.0, 20.0 | 19.5 | 11.85 | haze | 245 | -0.32 |
| 93 | Apr. 4 | 16 | 6940.92 | 237 | 40 | <i>t5v</i> , <i>vz</i> , <i>v4-5y</i> | 17.0, 19.0, 20.4 | 18.8 | 11.98 | .... | 256 | +0.03 |
| 94 | 30 | 15 | 6966.88 | 237 | 40 | <i>v1-2x</i> , <i>v6t</i> ? | 20.5, (16.6) | 20.5 | 11.66 | good | 282 | +0.26 |
| 95 | May 31 | 9 | 6977.63 | 150 | 6 | <i>j2v</i> , <i>v5-6l</i> (<i>y</i> seen) | 30.1, 31.2 | 30.5 | 10.00 | fair | 313 | -0.25 |
| 96 | June 22 | 9 | 7019.63 | 150 | 6 | <i>vl</i> , <i>v1m</i> , <i>v3n</i> | 25.7, 25.1, 26.6 | 25.6 | 10.80 | good | 9 | +0.50 |
| 97 | July 26 | 9 | 7053.63 | 150 | 6 | <i>o2-3v</i> , <i>v2x</i> | 19.5, 21.0 | 20.2 | 11.72 | fair | 43 | +0.23 |
| 98 | Aug. 9 | 9 | 7067.63 | 150 | 6 | <i>x3-4v</i> , <i>v2-3y</i> | 15.5, 18.4 | 17.0 | 12.30 | good | 57 | +0.29 |
| 99 | 20 | 9 | 7078.62 | 237 | 40 | <i>y5-6v</i> , <i>v2t</i> | 10.9, 12.6 | 11.8 | 13.28 | poor | 68 | +0.77 |
| 100 | 22 | 9 | 7080.63 | 237 | 40 | <i>x8-10v</i> , <i>y3v</i> , <i>v4t</i> | 10.0, 13.4, 14.6 | 13.0 | 13.01 | good | 70 | +0.36 |
| 101 | Sept. 2 | 11 | 7091.71 | 237 | 40 | <i>t4-5v</i> , <i>v6γ</i> , <i>v8θ</i> | 6.1, 11.7, 8.3 | 8.0 | 13.97 | good | 81 | +0.87 |
| 102 | 19 | 7 | 7108.54 | 237 | 40 | <i>t5v</i> , <i>v2γ</i> | 5.6, 7.7 | 7.0 | 14.16 | good | 98 | +0.46 |
| 103 | Oct. 1 | 10 | 7120.67 | 750 | 40 | <i>v</i> not seen, limit <i>y</i> ..... | ..... | < 5.7 | < 14.4 | poor | ... | .... |
| 104 | 21 | 9 | 7140.63 | 750 | 40 | <i>γ6-8v</i> , <i>θv</i> , <i>v4δ±</i> | -1.3, 0.3, 3.5 | 1.2 | 15.30 | good | 130 | +0.68 |
| 105 | Nov. 18 | 6 | 7168.51 | 450 | 40 | <i>δ5-6v</i> ..... | ..... | - 6.0 | 16.5 | good | 158 | +2.0 |
| 106 | Dec. 30 | 6 | 7210.51 | 750 | 40 | <i>v6δ</i> , <i>γ3-4v</i> | 5.5, 9.2 | 7.9 | 14.00 | good | 200 | +0.10 |

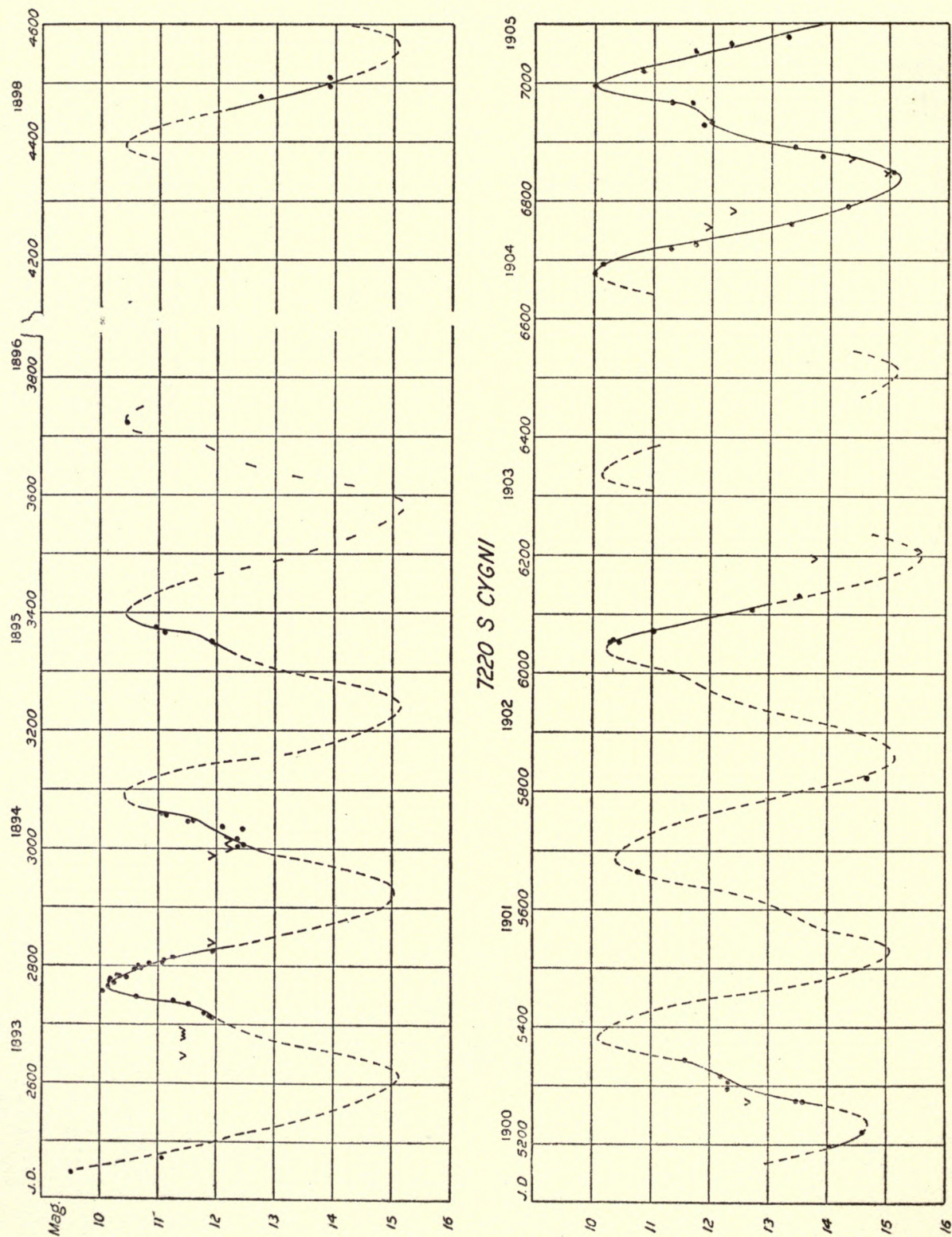


FIG. 26 --LIGHT-CURVE OF S CYGNI.

TABLE 78—7220 S CYGNI. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1893 October 28 (J. D. 2412765) + 32nd (E - 32). $M - m = 162^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|---------------|-------|-------|-------|-------|-----|---------|---------------|-------|------|------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 32 | 1893 Oct. 26 | 2763 | 10.10 | 10.35 | - 2 | 33 | 32 | 1893 May 19 | 2603 | .... | mc | 0 | 1 |
| 33 | 1894 Sept. 20 | 3092 | .... | mc | + 1 | 5 | 33 | 1894 Apr. 6 | 2925 | .... | mc | - 4 | 2 |
| 34 | 1895 July 25 | 3400 | .... | mc | - 17 | 2 | 34 | 1895 Feb. 15 | 3240 | .... | mc | - 15 | 1 |
| 37 | 1898 Apr. 16 | 4396 | .... | mc | + 1 | 1 | 38 | 1898 Sept. 25 | 4558 | .... | mc | - 1 | 4 |
| 40 | 1900 Dec. 27 | 5381 | .... | mc | + 8 | 6 | 40 | 1900 July 29 | 5230 | .... | mc | + 19 | 8 |
| 41 | 1901 Nov. 1 | 5690 | 10.4 | 10.6 | - 9 | 1 | 42 | 1902 Apr. 20 | 5860 | .... | mc | - 3 | 1 |
| 42 | 1902 Oct. 17 | 6040 | 10.2 | 10.5 | + 15 | 4 | 43 | 1903 Mar. 26 | 6200 | 15.6 | 15.8 | + 13 | 4 |
| 44 | 1904 July 18 | 6680 | 10.0 | 10.3 | + 3 | 4 | 45 | 1904 Dec. 25 | 6840 | 15.2 | 15.4 | + 1 | 13 |
| 45 | 1905 May 29 | 6995 | 10.06 | 10.31 | + 8 | 12 | 46 | 1905 Nov. 18 | 7168 | 16.5 | 16.8 | + 3 | 8 |

TABLE 79.—COMPARISON OF PHOTOMETRIC MAGNITUDES.

| Star. | H. C. O. Vol. 37. | H. M. Park- hurst. | J. A. Parkhurst. | | Star. | H. C. O. Vol. 37. | H. M. Park- hurst. | J. A. Parkhurst. | |
|----------|----------------------|--------------------------|------------------|-------|----------|----------------------|--------------------------|------------------|-------|
| | | | H. | P. | | | | H. | P. |
| <i>a</i> | 7.78 | 7.93 | 7.53 | 7.78 | <i>l</i> | .... | 11.19 | 10.53 | 10.78 |
| <i>c</i> | 8.76 | 8.99 | 8.54 | 8.79 | <i>m</i> | 11.62 | .... | 10.73 | 10.98 |
| <i>d</i> | 9.18 | 9.25 | 8.98 | 9.23 | <i>o</i> | 12.14 | .... | 11.32 | 11.57 |
| <i>e</i> | 9.43 | 9.66 | 9.39 | 9.64 | <i>x</i> | 12.90 | .... | 11.95 | 12.20 |
| <i>f</i> | .... | 10.27 | 9.87 | 10.12 | <i>y</i> | .... | 13.48 | 12.31 | 12.56 |

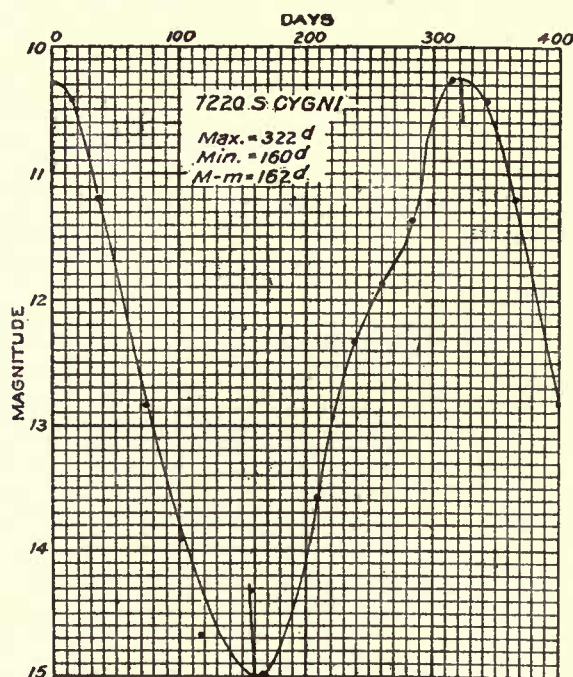


FIG. 27.—MEAN LIGHT-CURVE OF S CYGNI.

The mean light-curve was derived from observations as far as 1905 March 24. It shows a steady and rapid decline, with a well-defined minimum, a halt in the rise at about 12th magnitude, and a maximum about as sharp as the minimum. The halt in the rise is referred to by Townley as a double maximum, but nothing is shown of it in the mean light-curve published in the *Harvard Annals* 37, Plate III. In the light-curve, fig. 26, this halt is shown before the maxima of epochs 32, 33, 34, 40, and 45. At the other maxima the observations are too few to furnish evidence.

LATER NOTE.—It was possible to observe the minimum, epoch 46, in the fall of 1905, in better conditions than any previous one. Advantage was taken of an unusually clear night, November 18, to secure photometer measures of the faint comparison star δ with the result, 15.48 and 15.73, on the Harvard and Potsdam scales, respectively. The variable was then $16\frac{1}{2}$ (corresponding to $16\frac{3}{4}$ on the Potsdam scale), the faintest ever observed.

The difference in scale is very noticeable in Table 79; as compared with mine, the Harvard and H. M. Parkhurst scales are respectively 15 and 16 per cent more extended. The reasons for this discordance are not clear, but it should be noted that the measures of the faint stars in the Harvard list all depend on the single star a ($=C$ of Table 70, color GW), too slender a basis it would seem, especially as the meridian photometer measures in Volume 44 of the *Annals* depend on three zones, one of which was interrupted and the other two stopped by clouds. It may also be said that the stars x and y were used with the 6-inch, which would make the limit of that instrument about 13.7 if the Harvard scale is accepted. Taking everything into account, it seems probable that the truth lies between the two scales.

CHAPTER X.

7269 SX CYGNI.

R. A. 20^h 11^m 33^s.2, Dec. +30° 45' 58" (1900).

This variable was discovered by Anderson in 1899 and observations began in October of that year, measurements being made of the place of the variable and the brighter comparison stars with the 6-inch. The place given above was derived from the Leyden A. G. stars *h* and *m* (= +30° 3962 and 3967), and is almost identical with that given by Hartwig, whose observations of the star's variations, not yet published, seem to be the only ones which will be available for comparison with the present series. In the *Vierteljahrsschrift* 39, 261, Hartwig derives the period 548 days from the interval between the maxima 1899 August 20 (J. D. 4887) and 1904 February 18 (J. D. 6529), using the divisor 3. Reference to the light-curve (fig. 29) shows that the divisor should be 4, which would give 410 days from the above maxima. This is in close agreement with the period 409 days, derived from the present series.

Consideration of the limits of visibility of the 6- and 12-inch, renders it probable that the photometric magnitudes of the stars fainter than *p* are about half a magnitude too small numerically, and therefore the minimum magnitude of the variable is nearer 14.0 on the Harvard, and 14.4 on the Potsdam scales.

TABLE 80.—7269 SX CYGNI. STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|----------|-----------|--------------|----------|-----------------|------------|-------|-----------|------|------------|-----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P.DM. | H. | P. | H. | P. | |
| <i>E</i> | ° | <i>h m s</i> | ° ' | | | | | | | | |
| <i>F</i> | +29 3948 | 20 10 15 | +29 54.2 | W | 7.03 | 7.37 | 7.14 | 7.49 | +11 | +12 | ±7 |
| <i>G</i> | +31 4001 | 20 10 17 | +31 40.8 | GW | 7.38 | 7.58 | 7.19 | 7.54 | -19 | -4 | ±3 |
| | +31 4020 | 20 12 55 | +31 11.9 | W | 6.83 | 7.34 | 6.90 | 7.25 | +7 | -11 | ±4 |
| | Mean ... | ..... | ..... | ..... | 7.08 | 7.43 | 7.08 | 7.43 | ±12 | ±9 | ±5 |

TABLE 81.—7269 SX CYGNI. COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|----------|------|--------------|----------|----------|----------|------|--------------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | ° | | <i>h m s</i> | ° ' | | ° | | <i>h m s</i> | ° ' |
| <i>m</i> | +30 3962 | 8.8 | 20 9 48 | +30 49.8 | <i>h</i> | +30 3967 | 7.7 | 20 9 56 | +30 47.6 |
| <i>c</i> | +30 3963 | 9.3 | 20 9 48 | +30 42.2 | <i>l</i> | +30 3970 | 9.2 | 20 10 5 | +30 2.6 |
| <i>a</i> | +30 3964 | 9.1 | 20 9 49 | +30 32.6 | <i>k</i> | +30 3973 | 9.4 | 20 10 48 | +30 1.9 |
| <i>b</i> | +30 3965 | 9.4 | 20 9 50 | +30 38.4 | | | | | |

TABLE 82.—COMPARISON STARS FOR 7269 SX CYGNI (IN ORDER OF RIGHT ASCENSION).

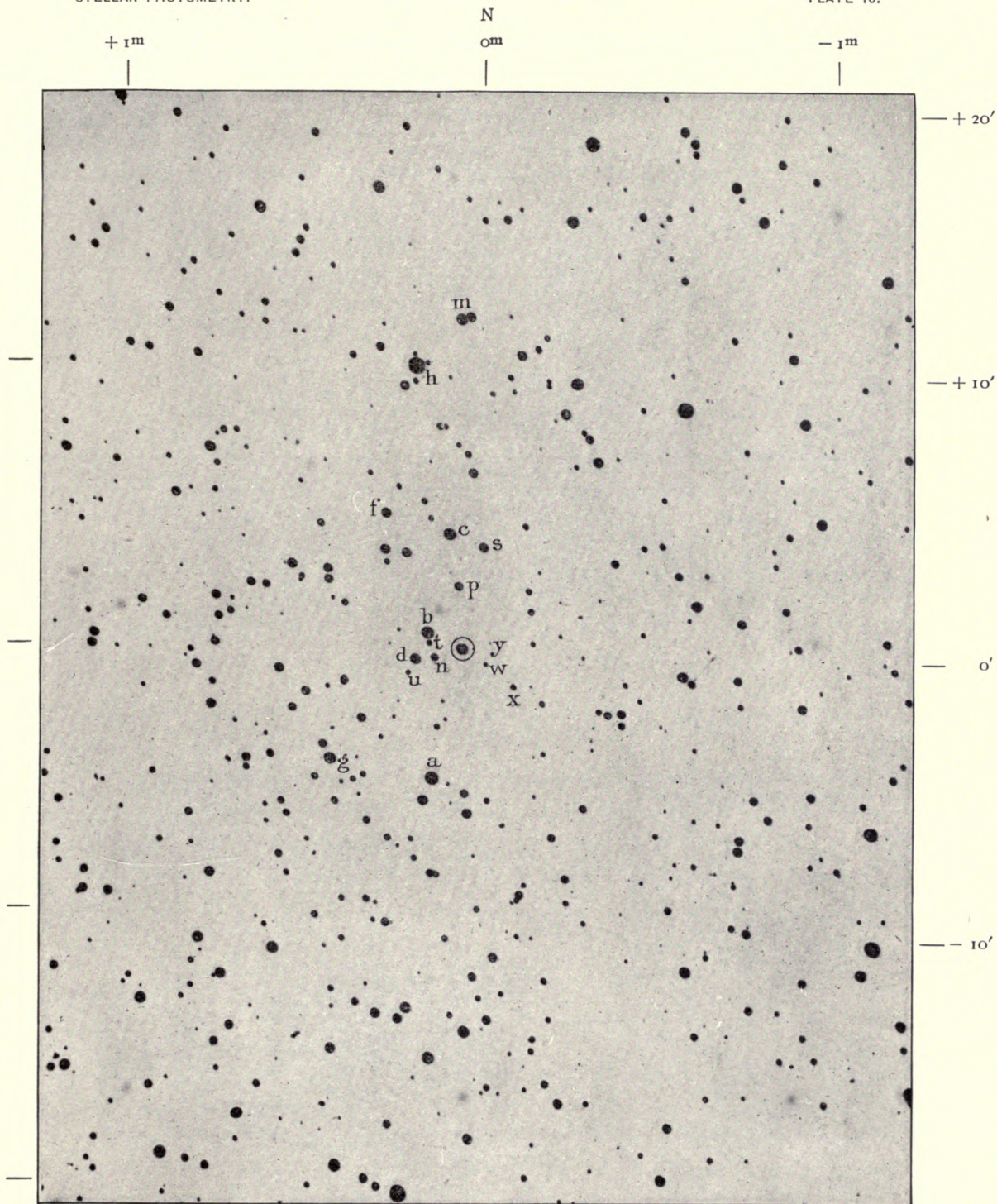
| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|----------|----------------------------|--------|--------|---------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | | | | | H. | P. | H. | P. |
| | " | s | " | | | | | |
| <i>x</i> | — 118 | — 9.2 | — 79 | 13.5 | 12.50 | 12.85 | ..... | ..... |
| <i>y</i> | — 63 | — 5.0 | + 17 | 7.0 | 13.54 | 13.89 | ..... | ..... |
| <i>w</i> | — 55 | — 4.3 | — 32 | 10.0 | 13.15 | 13.50 | ..... | ..... |
| <i>s</i> | — 37 | — 2.9 | + 225 | 24.6 | 11.00 | 11.35 | ..... | ..... |
| <i>p</i> | + 17 | + 1.3 | + 140 | 22.4 | 11.79 | 12.14 | ..... | ..... |
| <i>z</i> | + 25 | + 1.9 | + 18 | 0.0 | ..... | ..... | 14.40 | 14.75 |
| <i>c</i> | + 30 | + 2.3 | + 252 | 38.0 | 9.61 | 9.96 | ..... | ..... |
| <i>a</i> | + 57 | + 4.4 | + 284 | 43.0 | 8.83 | 9.18 | ..... | ..... |
| <i>n</i> | + 59 | + 4.6 | — 21 | 18.4 | 11.84 | 12.19 | ..... | ..... |
| <i>m</i> | + 33 | + 2.6 | + 722 | 32.5 | 9.44 | 9.79 | ..... | ..... |
| <i>t</i> | + 74 | + 5.7 | + 10 | 11.5 | ..... | ..... | 13.00 | 13.35 |
| <i>b</i> | + 78 | + 6.1 | + 32 | 36.2 | 9.87 | 10.22 | ..... | ..... |
| <i>d</i> | + 103 | + 8.0 | — 26 | 31.3 | 10.50 | 10.85 | ..... | ..... |
| <i>u</i> | + 118 | + 9.1 | — 57 | 10.5 | ..... | ..... | 13.13 | 13.48 |
| <i>h</i> | + 129 | + 10.0 | + 616 | 52.0 | 7.44 | 7.79 | ..... | ..... |
| <i>l</i> | + 179 | + 13.9 | — 2043 | 36.6 | ..... | ..... | 9.65 | 10.00 |
| <i>f</i> | + 181 | + 14.0 | + 292 | 33.3 | ..... | ..... | 10.10 | 10.45 |
| <i>k</i> | + 259 | + 20.1 | — 2124 | 37.6 | ..... | ..... | 9.51 | 9.86 |
| <i>g</i> | + 284 | + 22.0 | — 251 | 34.2 | ..... | ..... | 9.98 | 10.33 |

TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.

| 1904 September 5. | | | 6-INCH. | | | Good, somewhat dull. | | | |
|-------------------|------------|-----------------------|-----------------|----------------------|------------|----------------------|------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | ° | | | | | | | | |
| 20 5 | 10 | <i>F</i> | 10.2 9.9 10.2 | 10.10 | 10.90 | 0.38 | 7.23 | 7.58 | |
| | | <i>G_{at}</i> | 12.5 13.1 13.0 | 12.87 | ..... | 0.62 | 7.47 | 7.82 | |
| | | <i>c</i> | 29.7 29.6 29.1 | 29.47 | 30.64 | 2.76 | 9.61 | 9.96 | |
| | | <i>b</i> | 29.5 30.1 30.6 | 30.07 | 31.32 | 2.84 | 9.69 | 10.04 | |
| | | <i>a</i> | 23.5 22.8 23.3 | 23.20 | 23.50 | 1.98 | 8.83 | 9.18 | |
| | | <i>h</i> | 13.9 14.2 14.2 | 14.10 | 14.10 | 0.80 | 7.65 | 8.00 | |
| | | <i>E</i> | 9.6 9.8 9.2 | 9.53 | 9.83 | 0.27 | 7.12 | 7.47 | |
| | | <i>E</i> | 10.0 10.2 10.2 | 10.13 | ..... | ..... | ..... | ..... |  |
| | | <i>h</i> | 13.8 14.0 14.5 | 14.10 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 24.0 24.2 23.2 | 23.80 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 32.1 32.6 33.0 | 32.57 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 31.9 31.7 31.8 | 31.80 | ..... | ..... | ..... | ..... |  |
| | | <i>G</i> | 9.4 9.0 8.4 | 8.93 | ..... | ..... | ..... | ..... |  |
| 20 31 | 13 | <i>F</i> | 11.7 11.8 11.6 | 11.70 | ..... | ..... | ..... | ..... |  |

STELLAR PHOTOMETRY.

PLATE 10.



Scale, 1 mm = 13''.6.

S

1902 November 30.

7269 SX CYGNI.

R. A. 20^h 11^m 33^s.2. Dec. +30° 45' 58'', 1900.

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TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 October 1. | | | 6-INCH. | | | | Good. | | |
|------------------|------------|------------|-----------------|----------------------|------------|-------|---------------------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | <i>°</i> | | | | | | | | |
| 22 4 | 26 | <i>F</i> | 9.2 10.2 9.2 | 9.53 | 9.58 | 0.25 | 7.14 | 7.49 | |
| | | <i>Gat</i> | 13.5 13.5 13.3 | 13.43 | 13.53 | 0.72 | 7.61 | 7.96 | |
| | | <i>c</i> | 29.7 30.9 30.0 | 30.20 | 30.30 | 2.72 | 9.61 | 9.96 | |
| | | <i>b</i> | 31.5 32.0 31.6 | 31.70 | 31.52 | 2.87 | 9.76 | 10.11 | |
| | | <i>a</i> | 26.4 26.2 26.3 | 26.30 | 25.02 | 2.13 | 9.02 | 9.37 | |
| | | <i>E</i> | 10.6 9.0 9.7 | 9.77 | 10.12 | 0.29 | 7.18 | 7.53 | |
| | 28 | <i>Eat</i> | 16.6 15.9 16.0 | 16.17 | ..... | 1.20 | 8.09 | 8.44 | |
| | | <i>E</i> | 10.2 10.2 11.0 | 10.47 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 23.2 24.1 23.9 | 23.73 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 31.0 31.1 31.9 | 31.33 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 30.2 31.0 30.0 | 30.40 | ..... | ..... | ..... | ..... |  |
| | | <i>Gat</i> | 13.0 14.1 13.8 | 13.63 | ..... | ..... | ..... | ..... |  |
| 22 21 | 29 | <i>F</i> | 9.7 9.9 9.3 | 9.63 | ..... | ..... | ..... | ..... |  |
| 1904 October 2. | | | | | | | Good. | | |
| 22 5 | 27 | <i>Fat</i> | 13.5 13.9 14.0 | 13.80 | 14.19 | 0.81 | 7.95 | 8.30 | |
| | | <i>Ga</i> | 12.3 13.2 12.5 | 12.67 | 12.52 | 0.58 | 7.72 | 8.07 | |
| | | <i>h</i> | 10.4 10.0 9.3 | 9.90 | 10.15 | 0.29 | 7.43 | 7.78 | |
| | | <i>c</i> | 29.8 29.0 28.8 | 29.20 | 28.82 | 2.54 | 9.68 | 10.03 | |
| | | <i>b</i> | 30.0 31.0 30.2 | 30.73 | 30.30 | 2.75 | 9.89 | 10.24 | |
| | | <i>a</i> | 20.2 20.7 20.6 | 20.50 | 21.30 | 1.74 | 8.88 | 9.23 | |
| | | <i>Eat</i> | 12.5 13.8 13.1 | 13.13 | 13.25 | 0.67 | 7.81 | 8.16 | |
| | | <i>Eat</i> | 12.9 13.8 13.4 | 13.37 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 22.1 21.9 22.3 | 22.10 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 30.1 29.8 29.7 | 29.87 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 28.9 27.9 28.5 | 28.43 | ..... | ..... | ..... | ..... |  |
| | | <i>h</i> | 10.1 10.9 10.2 | 10.40 | ..... | ..... | ..... | ..... |  |
| | | <i>Gat</i> | 12.4 12.3 12.4 | 12.37 | ..... | ..... | ..... | ..... |  |
| 22 21 | 29 | <i>Fat</i> | 14.8 14.7 14.2 | 14.57 | ..... | ..... | ..... | ..... |  |
| 1904 October 28. | | | 12-INCH. | | | | Good, moon rising at end. | | |
| 22 44 | 32 | <i>m</i> | 19.4 19.6 19.9 | 19.63 | 20.20 | 1.73 | 9.44 | 9.79 | |
| | | <i>hat</i> | 9.8 10.1 9.7 | 9.87 | 10.47 | 0.49 | 8.20 | 8.55 | |
| | | <i>c</i> | 21.0 21.7 21.5 | 21.40 | 20.65 | 1.78 | 9.49 | 9.84 | |
| | | <i>s</i> | 36.1 35.9 35.9 | 35.97 | 35.69 | 3.27 | 10.98 | 11.33 | |
| | | <i>p</i> | 42.1 42.2 41.8 | 42.03 | 42.80 | 4.08 | 11.79 | 12.14 | |
| | | <i>b</i> | 27.8 26.7 26.0 | 26.83 | 26.37 | 2.31 | 10.02 | 10.37 | |
| | | <i>d</i> | 30.8 30.8 30.0 | 30.53 | 30.78 | 2.74 | 10.45 | 10.80 | |
| | | <i>a</i> | 14.0 15.3 14.1 | 14.47 | 15.24 | 1.09 | 8.80 | 9.15 | |
| | | <i>a</i> | 16.1 16.0 15.9 | 16.00 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 31.9 31.1 30.1 | 31.03 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 25.9 26.0 25.8 | 25.90 | ..... | ..... | ..... | ..... |  |
| | | <i>p</i> | 43.9 43.7 43.1 | 43.57 | ..... | ..... | ..... | ..... |  |
| | | <i>s</i> | 35.2 36.0 35.0 | 35.40 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 19.5 20.1 20.1 | 19.90 | ..... | ..... | ..... | ..... |  |
| | | <i>hat</i> | 11.1 11.2 10.9 | 11.07 | ..... | ..... | ..... | ..... |  |
| 23 0 | 34 | <i>m</i> | 20.2 21.1 21.0 | 20.77 | ..... | ..... | ..... | ..... |  |

TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 November 1. | | | 12-INCH. | | | | Good. | |
|------------------|------------|-----------|---------------------------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | <i>a</i> | 20.0 19.3 19.8 | 19.70 | 19.52 | 1.65 | 8.81 | 9.16 |
| 22 20 | 28 | <i>d</i> | 36.8 36.1 36.0 | 36.30 | 36.49 | 3.36 | 10.52 | 10.87 |
| | | <i>b</i> | 29.2 28.9 29.7 | 29.27 | 29.55 | 2.61 | 9.77 | 10.12 |
| | | <i>p</i> | 47.9 47.3 46.9 | 47.37 | 47.65 | 4.59 | 11.75 | 12.10 |
| | | <i>s</i> | 38.9 39.1 39.7 | 39.23 | 40.30 | 3.81 | 10.97 | 11.32 |
| | | <i>c</i> | 29.2 29.1 29.2 | 29.17 | 28.14 | 2.57 | 9.73 | 10.08 |
| | | <i>ha</i> | 15.7 15.8 14.6 | 15.37 | ..... | 1.09 | 8.25 | 8.60 |
| | | <i>m</i> | 26.9 26.7 25.7 | 26.43 | ..... | 2.32 | 9.48 | 9.83 |
| | | <i>c</i> | 27.2 26.8 27.3 | 27.10 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 41.1 41.3 41.7 | 41.37 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 47.7 47.8 48.3 | 47.93 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 29.4 29.8 30.3 | 29.83 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 35.7 36.9 37.4 | 36.67 | ..... | ..... | ..... | ..... |
| 22 35 | 30 | <i>a</i> | 19.4 19.3 19.3 | 19.33 | ..... | ..... | ..... | ..... |
| 1904 November 3. | | | | | | | | |
| | | | | | | | Good. | |
| 23 12 | 37 | <i>m</i> | 18.3 19.3 19.2 | 18.93 | 19.25 | 1.62 | 9.40 | 9.75 |
| | | <i>ha</i> | 10.1 10.2 11.2 | 10.50 | 11.49 | 0.60 | 8.38 | 8.73 |
| | | <i>c</i> | 22.8 22.8 21.9 | 22.50 | 21.15 | 1.84 | 9.62 | 9.97 |
| | | <i>s</i> | 36.1 36.0 36.0 | 36.03 | 35.80 | 3.28 | 11.06 | 11.41 |
| | | <i>p</i> | 43.0 43.5 43.3 | 43.27 | 42.42 | 4.04 | 11.82 | 12.17 |
| | | <i>b</i> | 21.9 22.7 22.6 | 22.40 | 23.12 | 2.04 | 9.82 | 10.17 |
| | | <i>d</i> | 31.8 31.7 31.9 | 31.80 | 31.07 | 2.76 | 10.54 | 10.89 |
| | | <i>a</i> | 15.7 15.1 15.6 | 15.47 | 15.49 | 1.11 | 8.89 | 9.24 |
| | | <i>a</i> | 15.4 16.0 15.4 | 15.60 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 30.4 30.2 30.4 | 30.33 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 24.0 24.2 23.3 | 23.83 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 41.6 41.9 41.2 | 41.57 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 35.7 35.2 35.8 | 35.57 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 20.0 20.0 19.4 | 19.80 | ..... | ..... | ..... | ..... |
| | | <i>ha</i> | 13.8 12.1 13.0 | 12.97 | ..... | ..... | ..... | ..... |
| 23 34 | 41 | <i>m</i> | 19.0 19.7 20.0 | 19.57 | ..... | ..... | ..... | ..... |
| 1900 October 17. | | | 40-INCH, WEDGE II. | | | | | |
| | | | Images very large and unsteady. | | | | | |
| 24 | | <i>s</i> | 22.0 20.1 20.0 | 20.70 | 20.09 | 1.72 | 10.88 | 11.23 |
| | | <i>p</i> | 32.9 33.0 32.6 | 32.83 | 29.28 | 2.58 | 11.74 | 12.09 |
| | | <i>d</i> | 18.8 19.6 19.2 | 19.20 | 18.47 | 1.51 | 10.67 | 11.02 |
| | | <i>n</i> | 31.6 32.8 32.0 | 32.13 | 28.97 | 2.56 | 11.72 | 12.07 |
| | | <i>y</i> | 48.2 50.0 48.0 | 48.73 | 44.92 | 4.31 | 13.47 | 13.82 |
| | | <i>w</i> | 42.0 43.5 43.2 | 42.90 | 39.52 | 3.72 | 12.88 | 13.23 |
| | | <i>x</i> | 34.1 35.8 37.2 | 35.70 | 34.67 | 3.16 | 12.32 | 12.67 |
| | | <i>x</i> | 32.0 34.9 34.0 | 33.63 | ..... | ..... | ..... | ..... |
| | | <i>w</i> | 37.4 35.0 36.0 | 36.13 | ..... | ..... | ..... | ..... |
| | | <i>y</i> | 42.0 40.1 41.2 | 41.10 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 25.9 27.7 23.8 | 25.80 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 13.5 19.5 20.2 | 17.73 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 26.8 24.5 25.9 | 25.73 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 18.3 20.0 20.1 | 19.47 | ..... | ..... | ..... | ..... |

TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1902 October 24. | | 40-INCH, WEDGE V. | | | | Seeing good. | | |
|---------------------|------------|-------------------|-----------------|----------------------|------------|----------------------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 21 30 | | <i>s</i> | 15.8 17.0 17.8 | 16.87 | 18.44 | 1.50 | 10.96 | 11.31 |
| | | <i>p</i> | 27.0 27.0 26.0 | 26.67 | 27.07 | 2.38 | 11.84 | 12.19 |
| | | <i>d</i> | 14.0 12.6 13.3 | 13.30 | 14.29 | 1.03 | 10.49 | 10.84 |
| | | <i>n</i> | 28.0 29.2 29.4 | 28.87 | 29.00 | 2.55 | 12.01 | 12.36 |
| | | <i>v</i> | 25.7 24.8 24.9 | 25.13 | ..... | 2.21 | 11.67 | 12.02 |
| | | <i>y</i> | 43.0 43.2 43.6 | 43.27 | 44.00 | 4.21 | 13.67 | 14.02 |
| | | <i>w</i> | 40.8 40.3 40.0 | 40.27 | 40.25 | 3.80 | 13.26 | 13.61 |
| | | <i>x</i> | 34.5 34.3 34.2 | 34.33 | 34.48 | 3.13 | 12.59 | 12.94 |
| | | <i>x</i> | 34.4 34.5 35.0 | 34.63 | ..... | ..... | ..... | ..... |
| | | <i>w</i> | 39.2 40.7 40.8 | 40.23 | ..... | ..... | ..... | ..... |
| | | <i>y</i> | 44.8 45.4 44.0 | 44.73 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 30.2 27.8 29.4 | 29.13 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 15.2 14.8 15.8 | 15.27 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 27.5 27.2 27.7 | 27.47 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 20.0 20.0 20.0 | 20.00 | ..... | ..... | ..... | ..... |
| 22 00 | | | | | | | | |
| 1902 November 3. | | WEDGE V. | | | | Seeing fair to poor. | | |
| <i>h m</i> 1 20 | | <i>s</i> | 35.2 35.7 35.8 | 35.57 | 34.55 | 3.14 | 11.19 | 11.54 |
| | | <i>p</i> | 40.0 40.0 40.0 | 40.00 | 39.75 | 3.75 | 11.80 | 12.15 |
| | | <i>d</i> | 25.7 25.8 27.0 | 26.17 | 25.84 | 2.27 | 10.32 | 10.67 |
| | | <i>n</i> | 38.0 40.5 41.8 | 40.77 | 39.65 | 3.74 | 11.79 | 12.14 |
| | | <i>v</i> | 36.9 36.1 36.8 | 36.60 | ..... | 3.38 | 11.43 | 11.78 |
| | | <i>y</i> | 56.9 59.8 58.1 | 58.27 | 58.74 | 5.43 | 13.48 | 13.83 |
| | | <i>w</i> | 53.0 53.7 54.5 | 53.73 | 55.42 | 5.25 | 13.30 | 13.65 |
| | | <i>x</i> | 46.9 47.2 46.7 | 46.93 | 47.12 | 4.54 | 12.59 | 12.94 |
| | | <i>x</i> | 46.1 48.1 47.7 | 47.30 | ..... | ..... | ..... | ..... |
| | | <i>w</i> | 57.5 57.5 56.3 | 57.10 | ..... | ..... | ..... | ..... |
| | | <i>y</i> | 58.6 58.7 60.3 | 59.20 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 37.7 38.7 39.2 | 38.53 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 24.1 25.5 26.9 | 25.50 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 39.6 39.4 39.5 | 39.50 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 34.0 33.3 33.3 | 33.53 | ..... | ..... | ..... | ..... |

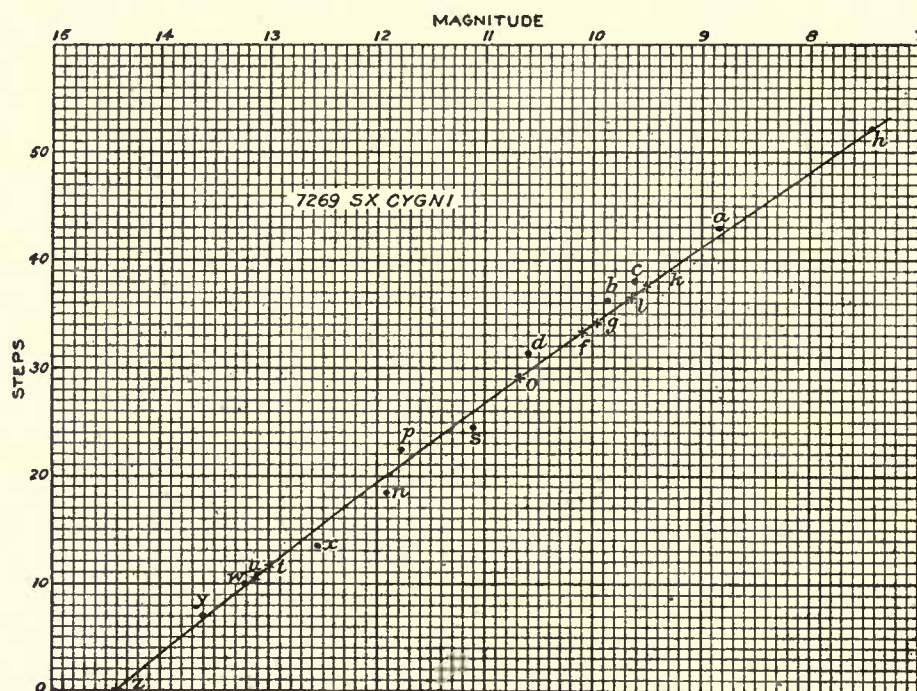


FIG. 28.—MAGNITUDE-CURVE FOR SX CYGNI.

TABLE 84.—7269 SX CYGNI. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|---------------------|-------------------|-----------|------|---------------|-----------|-----------------|-----------|------|---------------|-----------|-----------------|-----------|------|---------------|-----------|
| Star. | 1904 September 5. | | | | | 1904 October 1. | | | | | 1904 October 2. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| E... | 0.27 | 7.12 | 7.47 | + .09 | + .10 | 0.35 | 7.24 | 7.59 | + .21 | + .22 | -0.08 | 7.06 | 7.41 | + .03 | + .04 |
| F... | 0.38 | 7.23 | 7.58 | - .15 | .00 | 0.25 | 7.14 | 7.49 | - .24 | - .09 | 0.06 | 7.20 | 7.55 | - .18 | - .03 |
| G... | 0.03 | 6.72 | 7.07 | - .11 | - .27 | -0.03 | 6.86 | 7.21 | + .03 | - .13 | -0.17 | 6.97 | 7.32 | + .14 | - .02 |
| Means. | 0.23 | 7.08 | 7.43 | $\pm .12$ | $\pm .09$ | 0.19 | 7.08 | 7.43 | $\pm .16$ | $\pm .15$ | -0.06 | 7.08 | 7.43 | $\pm .12$ | $\pm .03$ |
| M ₀.... | .... | 6.85 | 7.20 | ... | ... | .... | 6.89 | 7.24 | ... | ... | .... | 7.14 | 7.49 | ... | ... |

| 12-INCH. | | | | | 40-INCH. | | | | |
|----------------------|-----------------|----------|---------|---------|----------------------|------------------|----------|---------|----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | |
| | | Oct. 28. | Nov. 1. | Nov. 3. | | | Oct. 24. | Nov. 3. | Oct. 17. |
| a..... | 8.91 | 1.09 | 1.65 | 1.11 | d..... | 10.50 | 1.03 | 2.27 | 1.51 |
| b..... | 9.78 | 2.31 | 2.61 | 2.04 | p..... | 11.79 | 2.38 | 3.75 | 2.58 |
| c..... | 9.63 | 1.78 | 2.57 | 1.84 | s..... | 11.00 | 1.50 | 3.14 | 1.72 |
| Mean C.... | .... | 1.73 | 2.28 | 1.66 | Mean C.... | .... | 1.64 | 3.05 | 1.94 |
| Mean Mag.. | 9.44 | 9.44 | 9.44 | 9.44 | Mean Mag. | 11.10 | 11.10 | 11.10 | 11.10 |
| M ₀..... | .... | 7.71 | 7.16 | 7.78 | M ₀..... | .... | 9.46 | 8.05 | 9.16 |

TABLE 85.—7269 SX CYGNI. MEAN MAGNITUDES OF COMPARISON STARS.

| 6-INCH. | | | | | | | | | |
|----------------|--------------|---------------|-------------|---------------|-------------|---------------|---------|---------|---------------|
| Star. | September 5. | | October 1. | | October 2. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>E</i> | 7.12 | -0.02 | 7.24 | +0.10 | 7.06 | -0.08 | 7.14 | 7.49 | ± 0.07 |
| <i>F</i> | 7.23 | +0.04 | 7.14 | -0.05 | 7.20 | +0.01 | 7.19 | 7.54 | ± 0.03 |
| <i>G</i> | 6.88 | -0.02 | 6.86 | -0.04 | 6.97 | +0.07 | 6.90 | 7.25 | ± 0.04 |
| Mean..... | | | | | | | 7.08 | 7.43 | ± 0.05 |
| <i>a</i> | 8.83 | -0.08 | 9.02 | +0.11 | 8.88 | -0.03 | 8.91 | 9.26 | ± 0.07 |
| <i>b</i> | 9.69 | -0.09 | 9.76 | -0.02 | 9.89 | +0.11 | 9.78 | 10.13 | ± 0.07 |
| <i>c</i> | 9.61 | -0.02 | 9.61 | -0.02 | 9.68 | +0.05 | 9.63 | 9.98 | ± 0.03 |
| <i>h</i> | 7.65 | +0.11 | ..... | ..... | 7.43 | -0.11 | 7.54 | 7.89 | ± 0.11 |
| Mean..... | | | | | | | 8.97 | 9.32 | ± 0.07 |
| 12-INCH. | | | | | | | | | |
| Star. | October 28. | | November 1. | | November 3. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>a</i> | 8.80 | -0.03 | 8.81 | -0.02 | 8.89 | +0.06 | 8.83 | 9.18 | ± 0.04 |
| <i>b</i> | 10.02 | +0.15 | 9.77 | -0.10 | 9.82 | +0.05 | 9.87 | 10.22 | ± 0.10 |
| <i>c</i> | 9.49 | -0.12 | 9.73 | +0.12 | 9.62 | +0.01 | 9.61 | 9.96 | ± 0.08 |
| Mean..... | | | | | | | 9.44 | 9.79 | ± 0.07 |
| <i>d</i> | 10.45 | -0.05 | 10.52 | +0.02 | 10.54 | +0.04 | 10.50 | 10.85 | ± 0.04 |
| <i>h</i> | 7.36 | -0.08 | 7.41 | -0.03 | 7.54 | +0.10 | 7.44 | 7.79 | ± 0.07 |
| <i>p</i> | 11.79 | 0.00 | 11.75 | -0.04 | 11.82 | +0.03 | 11.79 | 12.14 | ± 0.02 |
| <i>s</i> | 10.98 | -0.02 | 10.97 | -0.03 | 11.06 | +0.06 | 11.00 | 11.35 | ± 0.04 |
| <i>m</i> | 9.44 | 0.00 | 9.48 | +0.04 | 9.40 | -0.04 | 9.44 | 9.79 | ± 0.03 |
| Mean..... | | | | | | | 10.03 | 10.38 | ± 0.05 |
| 40-INCH. | | | | | | | | | |
| Star. | October 24. | | November 3. | | October 17. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>d</i> | 10.67 | +0.18 | 10.49 | 0.00 | 10.32 | -0.17 | 10.49 | 10.84 | ± 0.12 |
| <i>p</i> | 11.74 | -0.05 | 11.84 | +0.05 | 11.80 | +0.01 | 11.79 | 12.14 | ± 0.04 |
| <i>s</i> | 10.88 | -0.13 | 10.96 | -0.05 | 11.19 | +0.18 | 11.01 | 11.36 | ± 0.12 |
| Mean..... | | | | | | | 11.10 | 11.45 | ± 0.09 |
| <i>n</i> | 11.72 | -0.12 | 12.01 | +0.17 | 11.79 | -0.05 | 11.84 | 12.19 | ± 0.08 |
| <i>w</i> | 12.88 | -0.27 | 13.26 | +0.11 | 13.30 | +0.15 | 13.15 | 13.50 | ± 0.18 |
| <i>x</i> | 12.32 | -0.18 | 12.59 | +0.09 | 12.59 | +0.09 | 12.50 | 12.85 | ± 0.12 |
| <i>y</i> | 13.47 | -0.07 | 13.67 | +0.13 | 13.48 | -0.06 | 13.54 | 13.89 | ± 0.09 |
| Mean..... | | | | | | | 12.76 | 13.11 | ± 0.12 |

TABLE 86.—7269 SX CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|---|---|--------|--------|---------|-------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1899 Oct. 12 | 8 | 2410000+ 4940.58 | 80 | 6 | { v1b, v1c, v4d, a4-5v.... v1k, v2l, h8-10a, a4-5v. v1c, v2b, b3f, f2d, b2g.... | 37.2, 39.0, 35.3, 38.5 39.5, 38.5, 38.5.... 39.0, 38.2, | 38.2 | 9.41 | moon | 0 | -0.22 |
| 2 | 17 | 6 | 4945.50 | 80 | 6 | a6-7v, v1b, v1c, v2m.... | 36.5, 37.2, 39.0, 34.5 | 37.6 | 9.52 | moon | 5 | -0.18 |
| 3 | 20 | 7 | 4948.52 | 80 | 6 | co-1v, v1-2b..... | 37.0, 37.7..... | 37.4 | 9.53 | good | 8 | -0.24 |
| 4 | 23 | 8 | 4951.56 | 150 | 6 | v3-4d, vb..... | 34.8, 36.2..... | 35.5 | 9.80 | good | 11 | 0.00 |
| 5 | 28 | 7 | 4956.52 | 150 | 6 | b1v, v3d, limit n..... | 35.3, 34.3..... | 34.8 | 9.90 | good | 16 | +0.03 |
| 6 | Nov. 3 | 8 | 4962.58 | 150 | 6 | b2v, v3d..... | 34.2, 34.3..... | 34.2 | 9.98 | fair | 22 | 0.00 |
| 7 | 8 | 6 | 4967.50 | 150 | 6 | b2v, v3d..... | 34.2, 34.3..... | 34.2 | 9.98 | fair | 27 | -0.06 |
| 8 | 15 | 6 | 4974.50 | 150 | 6 | b4v, v1d..... | 32.2, 32.3..... | 32.2 | 10.26 | good | 34 | +0.10 |
| 9 | 20 | 6 | 4979.50 | 150 | 6 | b4v, v0-1d..... | 32.2, 31.8..... | 32.0 | 10.28 | fair | 39 | -0.04 |
| 10 | 25 | 6 | 4984.50 | 150 | 6 | b5v, v0-1d..... | 31.2, 31.8..... | 31.5 | 10.35 | fair | 44 | +0.02 |
| 11 | Dec. 4 | 7 | 4993.54 | 150 | 6 | b5v, v1d..... | 31.2, 32.3..... | 31.8 | 10.31 | good | 53 | -0.20 |
| 12 | 19 | 6 | 5008.50 | 150 | 6 | d1-2v..... | ..... | 29.8 | 10.60 | fair | 68 | -0.22 |
| 13 | 27 | 6 | 5016.50 | 150 | 6 | d4-5v, v10..... | 26.8, 30.1..... | 28.4 | 10.77 | good | 76 | -0.26 |
| 14 | 1900 Jan. 2 | 6 | 5022.50 | 150 | 6 | d5v, v0, v2-3p..... | 26.3, 29.1, 24.9.... | 26.8 | 11.00 | good | 82 | -0.22 |
| 15 | 22 | 6 | 5042.50 | 150 | 6 | v not seen, limit d..... | ..... | <31.3 | <10.4 | low | 102 | .... |
| 16 | 24 | 7 | 5044.52 | 200 | 6 | p3v, v1n, limit n..... | ..... | 19.4 | 11.98 | poor | 104 | -0.04 |
| 17 | 31 | 7 | 5051.52 | 200 | 6 | v not seen, limit 4 < 0.... | <25.1, <22..... | <23 | <11.5 | low | .... | .... |
| 18 | Mar. 2 | 13 | 5081.79 | 275 | 12 | n6v, limit v..... | 12.4..... | 12.4 | 12.89 | good | 141 | -0.11 |
| 19 | 6 | 17 | 5085.96 | 150 | 6 | v not seen, n not seen.... | ..... | <18.4 | <12.1 | fair | 146 | .... |
| 20 | 15 | 17 | 5094.95 | 350 | 40 | { v is 1 to 1½M < n, v near } { limit ..... } | ..... | ..... | 13.1 ± | poor | 155 | -0.04 |
| 21 | 22 | 16 | 5101.92 | 350 | 40 | v2w, v1t, t1u, x1v, x2w.... | 12.0, 12.5, 12.5.... | 12.3 | 12.90 | good | 162 | -0.32 |
| 22 | Apr. 4 | 16 | 5114.90 | 275 | 12 | w1v, t1-2v, v glimpsed.... | 9.0, 9.0..... | 9.0 | 13.31 | good | 175 | -0.01 |
| 23 | 6 | 16 | 5116.92 | 350 | 40 | x4v, wv, v3y..... | 9.5, 10.0, 10.0.... | 9.8 | 13.23 | poor | 177 | -0.07 |
| 24 | May 1 | 14 | 5141.85 | 275 | 12 | v suspected, t and y not held | ..... | <11.5 | <13.0 | poor | 202 | .... |
| 25 | 2 | 15 | 5142.88 | 350 | 40 | x4v, v1w, v3y..... | 9.5, 11.0, 10.0.... | 10.2 | 13.17 | fair | 203 | +0.03 |
| 26 | 11 | 14 | 5151.83 | 460 | 40 | x3-4v, v0-1w, v4-5y.... | 10.0, 10.5, 11.5.... | 10.7 | 13.11 | fair | 212 | +0.06 |
| 27 | 28 | 14 | 5168.83 | 275 | 12 | n6-8v, x1-2v, v2w, limit w. | 11.4, 12.0, 12.0.... | 11.8 | 12.98 | good | 229 | +0.14 |
| 28 | 29 | 12 | 5169.75 | 237 | 40 | n4v, vx, v3v, w10z, limit z. | 14.4, 13.5, 13.0.... | 13.6 | 12.75 | good | 230 | -0.05 |
| 29 | June 13 | 12 | 5184.75 | 460 | 40 | n3v, v3x, v5t, v5w.... | 15.4, 16.5, 16.5, 15.0 | 15.9 | 12.47 | fair | 245 | -0.13 |
| 30 | 23 | 10 | 5194.67 | 200 | 6 | n1-2v, limit 1 < v..... | ..... | 16.9 | 12.31 | good | 255 | -0.12 |
| 31 | July 16 | 9 | 5217.63 | 150 | 6 | s3v, vp, v3n..... | 21.6, 22.4, 21.4.... | 21.8 | 11.68 | good | 277 | -0.34 |
| 32 | Aug. 6 | 9 | 5238.63 | 150 | 6 | s2v, limit v..... | ..... | 22.6 | 11.57 | moon | 298 | +0.04 |
| 33 | 8 | 9 | 5240.63 | 150 | 6 | s3v, limit v..... | ..... | 21.6 | 11.7 ± | moon | 300 | +0.23 |
| 34 | 13 | 9 | 5245.63 | 150 | 6 | v1s, v4-5p, v8n, d8v.... | 25.6, 26.9, 26.4, 23.3 | 25.8 | 11.13 | good | 305 | -0.10 |
| 35 | 18 | 9 | 5250.63 | 150 | 6 | d1v, v3s..... | 30.3, 27.6..... | 29.0 | 10.70 | good | 310 | -0.37 |
| 36 | 28 | 9 | 5260.63 | 150 | 6 | b3v, v1-2d..... | 33.2, 33.8..... | 33.5 | 10.06 | good | 320 | -0.28 |
| 37 | Sept. 4 | 8 | 5267.58 | 40 | 6 | b2v, v6d..... | 34.2, 37.3..... | 35.2 | 9.85 | moon | 327 | +0.05 |
| 38 | 15 | 7 | 5278.54 | 150 | 6 | a5v, v1b, v1c..... | 38.0, 37.2, 39.0.... | 38.1 | 9.43 | good | 338 | +0.11 |
| 39 | 21 | 9 | 5284.63 | 40 | 6 | photometer..... | ..... | ..... | 8.89 | .... | .... | .... |
| 40 | Oct. 10 | 7 | 5303.54 | 150 | 6 | a5v, v3b..... | 38.0, 39.2..... | 38.6 | 9.37 | good | 363 | +0.30 |
| 41 | 26 | 7 | 5319.54 | 150 | 6 | a5v, vc, v1b..... | 38.0, 38.0, 37.2.... | 37.7 | 9.50 | good | 379 | +0.29 |
| 42 | Nov. 15 | 6 | 5339.50 | 150 | 6 | c2-3v, b2v, v4d..... | 35.5, 34.2, 35.3.... | 35.0 | 9.86 | good | 399 | +0.36 |
| 43 | 29 | 6 | 5353.50 | 150 | 6 | b4-5v, vd, v6s..... | 31.7, 31.3, 30.6.... | 31.2 | 10.39 | good | 4 | +0.69 |
| 44 | Dec. 11 | 6 | 5365.50 | 150 | 6 | b4-5v, do-1v, v5-6s.... | 31.7, 30.8, 29.9.... | 30.8 | 10.45 | good | 16 | +0.60 |
| 45 | 29 | 7 | 5383.50 | 150 | 6 | d6v, vs, v4p..... | 25.3, 24.6, 26.4.... | 25.2 | 11.20 | fair | 34 | +0.95 |
| 46 | 1901 Oct. 31 | 8 | 5689.58 | 80 | 12 | v1-2a..... | 44.5..... | 43.8 | 8.66 | .... | 340 | -0.56 |
| | | | | 275 | 12 | limit 6 < n, 2 < u, 1 < w, 2 < x | 43.0..... | ..... | ..... | ..... | ..... | ..... |
| 47 | Dec. 21 | 13 | 5740.79 | 350 | 40 | v1-2e..... | ..... | 39.5 | 9.24 | moon | 391 | -0.16 |
| 48 | 1902 Mar. 28 | 15 | 5837.88 | 237 | 40 | d5-6v, v3n..... | 25.8, 21.4..... | 23.6 | 11.43 | good | 80 | +0.23 |
| 49 | July 10 | 9 | 5941.63 | 80 | 12 | v not seen, limit 1 < n.... | ..... | <17.4 | <12.3 | good | .... | .... |
| 50 | Oct. 7 | 10 | 6030.67 | 80 | 12 | vn ±..... | ..... | 18.4 | 12.1 ± | good | 272 | 0.00 |

TABLE 86.—7269 SX CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | <i>t</i> . | <i>Δ</i> Mag. |
|-----|----------------|-------------|---------------------|---------|-----------|---|------------------------|--------|-------|---------|------------|---------------|
| | Month and Day. | Hour C.S.T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1902 | | 2410000+ | | | | | | | | | |
| 51 | Oct. 24 | 8 | 6047.58 | 237 | 40 | photometer..... | ..... | ..... | 11.73 | good | 289 | -0.07 |
| 52 | 31 | 9 | 6054.63 | 237 | 40 | <i>s</i> 4 <i>v</i> , <i>p</i> 1-2 <i>v</i> , <i>v</i> 2 <i>n</i> | 20.6, 20.9, 20.4.... | 20.6 | 11.85 | fair | 296 | +0.26 |
| 53 | Nov. 3 | 10 | 6057.67 | 237 | 40 | photometer..... | ..... | ..... | 11.49 | fair | 300 | +0.02 |
| 54 | 30 | 8 | 6084.58 | ... | 24 | photograph..... | ..... | ..... | 10.0± | .... | ... | .... |
| 55 | Dec. 26 | 13 | 6110.79 | 237 | 40 | <i>va</i>±..... | ..... | 43.± | 8.75± | fair | 353 | -0.31 |
| | 1903 | | | | | | | | | | | |
| 56 | Oct. 11 | 7 | 6399.54 | 150 | 6 | <i>v</i> glimpsed, <i>n</i> 3-4 <i>v</i>..... | ..... | 15.± | 12.6± | good | 231 | -0.19 |
| 57 | 13 | 9 | 6401.63 | 80 | 12 | <i>v</i> glimpsed, <i>n</i> 4-5 <i>v</i>..... | ..... | 14.± | 12.7± | fair | 233 | -0.03 |
| | 1904 | | | | | | | | | | | |
| 58 | July 31 | 11 | 6693.71 | 150 | 6 | <i>v</i> not seen, limit <i>u</i>..... | ..... | <10.5 | <13.1 | moon | ... | .... |
| 59 | Aug. 3 | 9 | 6696.63 | 67 | 12 | <i>u</i> 5 <i>v</i> , <i>v</i> 1 <i>x</i> | 5.5, 14.5..... | 10.± | 13.2± | good | 119 | +0.68 |
| 60 | 27 | 8 | 6720.58 | 150 | 6 | <i>v</i> not seen, limit 1-2< <i>n</i>..... | ..... | <17. | <12.3 | moon | ... | .... |
| 61 | Sept. 24 | 10 | 6748.67 | ... | 24 | {photographs, <i>v</i> not seen, limit 2< <i>w</i>.....} | ..... | <10. | <13.2 | moon | ... | .... |
| 62 | Oct. 6 | 10 | 6760.67 | 237 | 40 | <i>vy</i> , <i>v</i> certainly fainter than <i>w</i>..... | ..... | 7± | 13.6± | dull | 183 | -0.27 |
| 63 | 28 | .. | 6782. | 67 | 12 | <i>v</i> not seen, limit <i>n</i>..... | ..... | <18 | <12.2 | good | ... | .... |
| 64 | Nov. 30 | 12 | 6815.75 | 40 | 6 | <i>v</i> not seen, limit <i>n</i>..... | ..... | <18 | <12.2 | good | ... | .... |
| | 1905 | | | | | | | | | | | |
| 65 | Jan. 3 | 7 | 6849.54 | 237 | 40 | <i>n</i> 6 <i>v</i> , <i>v</i> 3 <i>x</i> , <i>v</i> 6 <i>w</i> | 12.4, 16.5, 16.0.... | 15.0 | 12.57 | fair | 272 | +0.47 |
| 66 | Feb. 14 | 17 | 6891.96 | 250 | 40 | <i>d</i> 6 <i>v</i> , <i>v</i> 6 <i>n</i> , <i>vs</i> , <i>v</i> 3 <i>p</i> | 25.3, 24.4, 24.6, 25.4 | 24.9 | 11.27 | good | 315 | +0.47 |
| 67 | Mar. 24 | 17 | 6929.96 | 40 | 6 | <i>vc</i> , <i>v</i> 1 <i>b</i> | 38.0, 37.2..... | 37.6 | 9.50 | fair | ... | .... |
| 68 | Apr. 4 | 16 | 6940.92 | 237 | 40 | <i>va</i>±..... | ..... | 43.0 | 8.75 | .... | ... | .... |
| 69 | 30 | 15 | 6966.88 | 150 | 6 | <i>a</i> 3 <i>v</i>±..... | ..... | 40.0 | 9.17 | poor | 389 | -0.19 |
| 70 | May 31 | 10 | 6997.67 | 150 | 6 | <i>b</i> 10-12 <i>v</i> ±, <i>v</i> 0-1 <i>d</i> | (25), 32.3..... | 32.3 | 10.23 | fair | 11 | +0.43 |
| 71 | June 22 | 10 | 7019.67 | 150 | 6 | <i>d</i> 6 <i>v</i> , <i>s</i> 1 <i>v</i> , <i>v</i> 4 <i>p</i> , <i>v</i> 6 <i>n</i> | 25.3, 23.6, 26.4, 24.4 | 24.9 | 11.25 | good | 33 | +1.11 |
| 72 | 26 | 11 | 7023.71 | 80 | 12 | <i>s</i> 2 <i>v</i> , <i>v</i> 2 <i>p</i> , <i>v</i> 4 <i>n</i> | 22.6, 24.4, 22.4.... | 23.1 | 11.50 | good | 37 | +1.29 |
| 73 | July 26 | 9 | 7053.63 | 150 | 6 | <i>vp</i> ±, near limit..... | ..... | 22.4 | 11.57 | fair | 67 | +0.70 |
| 74 | Aug. 6 | 10 | 7064.67 | 237 | 40 | <i>d</i> 5 <i>v</i> , <i>v</i> 1 <i>n</i> , <i>p</i> 1 <i>v</i> | 26.3, 19.4, 21.4.... | 20.9 | 11.80 | good | 78 | +0.66 |
| 75 | 9 | 9 | 7067.63 | 150 | 6 | <i>n</i> 3 <i>v</i> , <i>p</i> 4 <i>v</i> | 15.4, 19.4..... | 17.4 | 12.25 | fair | 81 | +1.03 |
| 76 | 28 | 9 | 7086.63 | 150 | 6 | <i>n</i> 2 <i>v</i> , limit 3< <i>n</i>..... | ..... | 16.4 | 12.38 | fair | 100 | +0.52 |
| 77 | Sept. 23 | 7 | 7112.54 | 237 | 40 | <i>vx</i> , <i>v</i> 4 <i>w</i> | 13.5, 14.0..... | 13.7 | 12.73 | good | 126 | -0.02 |
| 78 | Oct. 1 | 10 | 7120.67 | 237 | 40 | <i>x</i> 4 <i>v</i> , <i>v</i> 1 <i>w</i> | 9.5, 11.0..... | 10.5 | 13.11 | fair | 134 | +0.19 |
| 79 | 20 | 7 | 7139.54 | 80 | 12 | <i>v</i> not seen, limit 5< <i>n</i>..... | ..... | <13.4 | <12.8 | .... | ... | .... |
| 80 | 21 | 9 | 7140.63 | 237 | 40 | <i>x</i> 6 <i>v</i> , <i>w</i> 3-4 <i>v</i> , <i>v</i> 1-2 <i>y</i> | 7.5, 6.5, 8.5..... | 7.5 | 13.57 | good | 154 | +0.33 |
| 81 | Nov. 18 | 6 | 7168.50 | 237 | 40 | <i>w</i> 2 <i>v</i> , <i>v</i> 2 <i>y</i> | 8.0, 9.0..... | 8.5 | 13.37 | good | 182 | +0.07 |

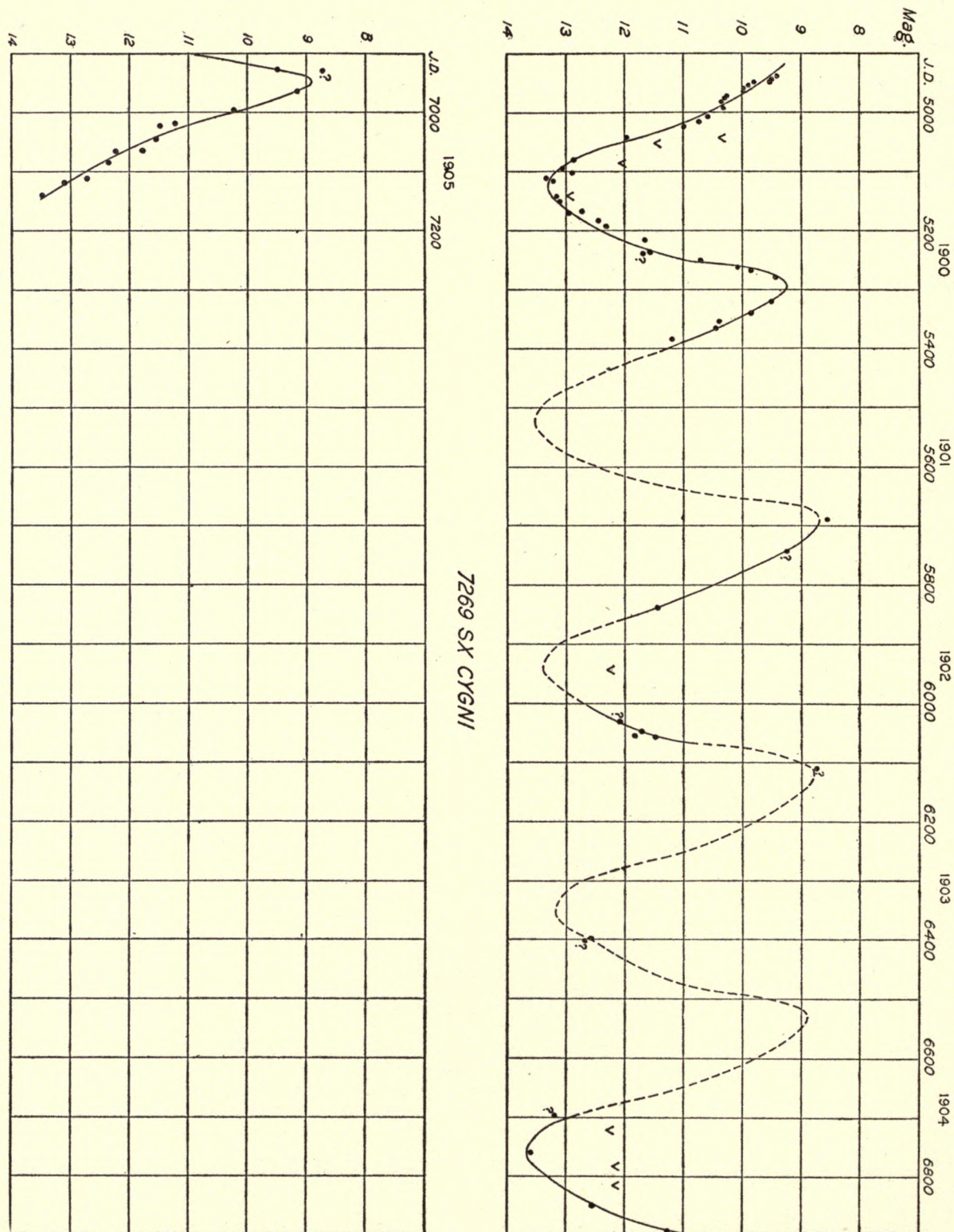


FIG. 29.—LIGHT-CURVE OF SX CYGNI.

TABLE 87.—7269 SX CYGNI. MEAN MAGNITUDES FROM 34.1 DAY GROUPS.

| Group No.... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D..... | 34.1 | 68.2 | 102.3 | 136.4 | 170.5 | 212.6 | 238.7 | 272.8 | 306.9 | 341.0 | 375.1 | 409.2 |
| 4940 { | <i>t</i> | 12 | 43 | 75 | 104 | 153 | 185 | 224 | 250 | 298 | 324 | 363 |
| | <i>M</i> | 9.73 | 10.30 | 10.79 | 11.98 | 12.96 | 13.24 | 12.95 | 12.39 | 11.52 | 10.04 | 9.37 |
| | ΔM | -0.10 | -0.03 | -0.23 | -0.04 | -0.16 | -0.04 | +0.05 | -0.12 | -0.04 | -0.12 | +0.30 |
| | No. | 7 | 4 | 3 | 1 | 3 | 3 | 3 | 2 | 4 | 4 | 2 |
| 5349 { | <i>t</i> | 10 | 34 | .... | .... | .... | .... | .... | .... | 340 | .... | 391 |
| | <i>M</i> | 10.42 | 11.20 | .... | .... | .... | .... | .... | .... | 8.66 | .... | 9.24 |
| | ΔM | +0.64 | +0.95 | .... | .... | .... | .... | .... | .... | -0.56 | .... | -0.16 |
| | No. | 2 | 1 | .... | .... | .... | .... | .... | .... | 1 | .... | 1 |
| 5758 { | <i>t</i> | .... | .... | 80 | .... | .... | .... | .... | 295 | .... | 353 | .... |
| | <i>M</i> | .... | .... | 11.43 | .... | .... | .... | .... | 11.69 | .... | 8.75 | .... |
| | ΔM | .... | .... | +0.23 | .... | .... | .... | .... | +0.07 | .... | -0.31 | .... |
| | No. | .... | .... | 1 | .... | .... | .... | .... | 3 | .... | 1 | .... |
| 6168 { | <i>t</i> | .... | .... | .... | .... | .... | 232 | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | .... | 12.65 | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | -0.11 | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | .... | 2 | .... | .... | .... | .... | .... |
| 6577 { | <i>t</i> | .... | .... | .... | 119 | .... | 183 | .... | 272 | .... | 315 | .... |
| | <i>M</i> | .... | .... | .... | 13.2± | .... | 13.6± | .... | 12.57 | .... | 11.27 | .... |
| | ΔM | .... | .... | .... | +0.68 | .... | +0.27 | .... | +0.47 | .... | +0.47 | .... |
| | No. | .... | .... | .... | 1 | .... | 1 | .... | 1 | .... | 1 | .... |
| 6986 { | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Means { | <i>t</i> | 12 | 41 | 76 | 112 | 153 | 184 | 227 | 257 | 297 | 324 | 358 |
| | <i>M</i> | 9.88 | 10.48 | 10.95 | 12.59 | 12.96 | 13.33 | 12.83 | 12.45 | 11.59 | 10.01 | 9.06 |
| | ΔM | -0.01 | +0.16 | -0.12 | +0.32 | -0.16 | +0.04 | -0.01 | +0.08 | +0.01 | -0.09 | 0.00 |
| | No. | 9 | 5 | 4 | 2 | 3 | 4 | 5 | 3 | 7 | 6 | 2 |

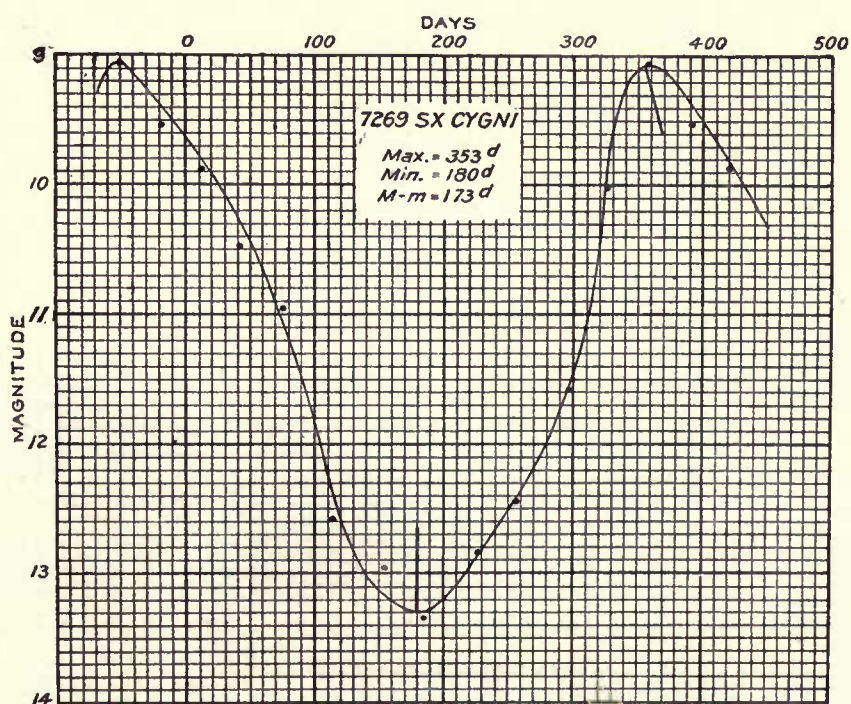


FIG. 30.—MEAN LIGHT-CURVE OF SX CYGNI.

TABLE 88.—7269 SX CYGNI. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1900 Oct. 2 (J. D. 2415295) + 409d E. $M-m=173^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|------|------|-------|-----|---------|--------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 0 | 1900 Oct. 2 | 5295 | 9.23 | 9.58 | 0 | 20 | 0 | 1900 Apr. 16 | 5126 | 13.30 | 13.65 | + 4 | 33 |
| 1 | 1901 Nov. 1 | 5690 | 8.8 | 9.1 | -14 | 2 | 1 | 1901 May 15 | 5520 | ..... | mc | -11 | 1 |
| 2 | 1903 Jan. 5 | 6120 | 8.8 | 9.2 | + 7 | 1 | 2 | 1902 July 9 | 5940 | ..... | mc | 0 | 7 |
| 3 | 1904 Feb. 19 | 6530 | ... | mc | + 8 | 0 | 3 | 1903 Aug. 23 | 6350 | ..... | mc | + 1 | 2 |
| 4 | 1905 Apr. 11 | 6947 | 8.90 | 9.25 | +16 | 17 | 4 | 1904 Oct. 7 | 6761 | 13.60 | 13.95 | + 3 | 7 |

The last observation used in forming the mean light-curve was that of 1905 February 14, giving the elements at the head of Table 88. The maximum of 1905 April 11 indicates a slightly longer period, about 410 days. The magnitude at maximum ranges from 8.5 to 9.2 on the Harvard scale, the minimum about 13.5.

7458 V DELPHINI.

The discovery of the variability of this star, from the bright hydrogen lines in its spectrum, was made by Mrs. Fleming at the Harvard College Observatory in December, 1890. The announcement of the discovery made in the *Astronomische Nachrichten* 127, 5, gave the Right Ascension for 1900 as $20^h 41.3^m$ instead of 43.1^m . The other published notes which have come to the writer's attention concerning this star are as follows:

H. M. Parkhurst *Astronomical Journal*, 13, 192, 1894; 15, 20, 1895; 17, 65, 1896;
21, 9, 1900; 23, 81, 1903.

Yendell *Ibid.*, 13, 176, 195, 1893; 17, 79, 1896.

Astrophysical Journal, 12, 53, 1900; 14, 176, 1901.

POSITION OF THE VARIABLE.

| | R. A. | Dec. | Year. |
|--------------------------------------|--------------|--------------|-------|
| | <i>h m s</i> | <i>° ' "</i> | |
| Berlin A. G. Catalogue 8389..... | 20 41 25.02 | + 18 50 21.2 | 1875 |
| Precession for 25 years..... | + 1 08.12 | + 5 24.6 | |
| Berlin A. G. Catalogue 8389..... | 20 42 33.14 | + 18 55 45.8 | 1900 |
| Difference, variable minus x | + 0 40.5 | + 2 15.0 | |
| Place of variable..... | 20 43 13.6 | + 18 58 00.8 | 1900 |

145

THE CHART.

Plate 11 shows the field around the variable on a scale of 13."8 to the millimeter. It is a six-fold enlargement from a negative taken 1902 September 7, exposed from 9^h 17^m to 10^h 25^m, Central Standard Time, with the 24-inch reflector. The negative shows the star *A*, 16.3 magnitude, distinctly. The photographic magnitude of the variable on this plate is 10.4, which is 0.6 fainter than the visual brightness as given by the light-curve, fig. 32. This difference corresponds approximately to a color of 4 on Chandler's scale.

TABLE 89.—7458 V DELPHINI. STANDARD MAGNITUDE STARS.

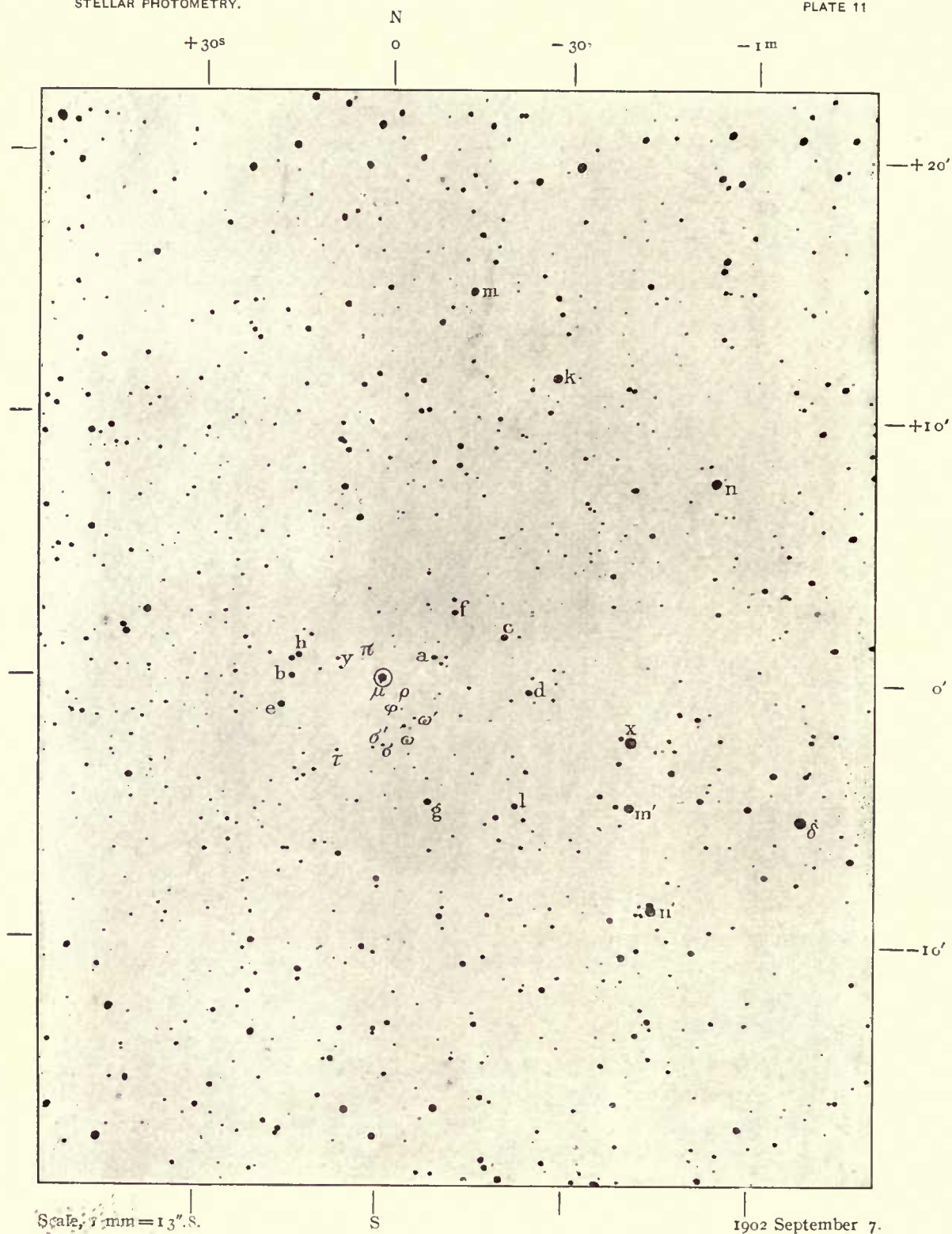
| Star. | B. D. No. | 1900. | | Color P.D.M. | Magnitude. | | | | Residuals. | | |
|----------|----------------|--------------|----------|-----------------|------------|--------|-----------|------|------------|-----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P.D.M. | H. | P. | H. | P. | |
| | ° | <i>h m s</i> | ° ′ | | | | | | | | |
| <i>F</i> | +19 4501 | 20 40 17 | +20 07.9 | GW | 7.07 | 7.11 | 7.02 | 7.28 | — 5 | +17 | ±4 |
| <i>G</i> | +19 4544 | 20 47 50 | +19 45.4 | GW | 7.22 | 7.95 | 7.55 | 7.81 | +33 | —14 | ±2 |
| <i>K</i> | +19 4555 | 20 49 38 | +19 22.7 | WG | 7.40 | 7.40 | 7.11 | 7.37 | —29 | — 3 | ±4 |
| | Mean . . . . . | ..... | ..... | ..... | 7.23 | 7.49 | 7.23 | 7.49 | ±22 | ±11 | ±3 |

THE COMPARISON STARS.

The data for the comparison stars are collected in Tables 89, 90, and 91, which are sufficiently explained by the headings of the columns. The difference between the mean magnitudes of the three fundamental stars in the Harvard and Potsdam catalogues, 0.26, is larger than usual, which seems to be due to the Harvard magnitude for the star *G* being 0.3 or 0.4 too small. The mean of three measures in October, 1883, is given as 6.91 in Harvard Annals, 24. The mean of three measures in September, 1894, is given as 7.52 in Volume 44 of the same Annals. Whether this difference is due to error in the first set of measures or to a change in the star itself remains unexplained.

TABLE 90.—7458 V DELPHINI. COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|------------|----------|------|--------------|----------|-----------|----------|------|--------------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | | | | | | | | | |
| | ° | | <i>h m s</i> | ° ' | | ° | | <i>h m s</i> | ° ' |
| ϵ | +18 4602 | 8.2 | 20 37 56 | +18 59.3 | <i>n'</i> | +18 4617 | 9.2 | 20 40 26 | +18 39.7 |
| ζ | +19 4500 | 8.0 | 20 38 14 | +19 11.1 | <i>m'</i> | +18 4618 | 9.0 | 20 40 29 | +18 43.2 |
| δ | +18 4611 | 8.8 | 20 40 2 | +18 43.9 | <i>x</i> | +18 4619 | 8.9 | 20 40 31 | +18 45.6 |
| <i>n</i> | +18 4614 | 9.1 | 20 40 13 | +18 55.5 | <i>k</i> | +19 4513 | 9.4 | 20 40 43 | +19 2.0 |



7458 V DELPHINI.
 R. A. $20^h 43^m 13^s.6$. Dec. $+18^\circ 58' 1''$, 1900.

TABLE 91.—COMPARISON STARS FOR V DELPHINI (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|---------------|----------------------------|-------|-------|---------------------------|------------|-------|-------------|------------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | | | | | H. | P. | H. | P. |
| | " | s | " | | | | | |
| δ | -984 | -69.4 | -305 | .... | 9.10 | 9.36 | ..... | ..... |
| n | -768 | -54.1 | +461 | 42.8 | ..... | ..... | 9.87 | 10.13 |
| n' | -640 | -45.1 | -515 | .... | 9.82 | 10.08 | ..... | ..... |
| m' | -584 | -41.2 | -340 | .... | 9.78 | 10.04 | ..... | ..... |
| x | -575 | -40.5 | -135 | 46.4 | 9.29 | 9.55 | ..... | ..... |
| k | -391 | -27.6 | +696 | 40.2 | ..... | ..... | 10.28 | 10.54 |
| d | -336 | -23.6 | -28 | 33.5 | 11.05 | 11.31 | ..... | ..... |
| l | -313 | -22.0 | -289 | 36.6 | 11.63 | 11.89 | ..... | ..... |
| c | -280 | -19.7 | +96 | 30.9 | 11.31 | 11.57 | ..... | ..... |
| m | -194 | -13.7 | +890 | 40.9 | ..... | ..... | 10.17 | 10.43 |
| f | -164 | -11.5 | +149 | 34.5 | 11.04 | 11.30 | ..... | ..... |
| a | -117 | -8.3 | +48 | 27.6 | 12.13 | 12.39 | ..... | ..... |
| g | -107 | -7.5 | -285 | 36.4 | 10.95 | 11.21 | ..... | ..... |
| w' | -76 | -5.4 | -92 | .... | 14.3 | 14.6 | ..... | ..... |
| w | -56 | -3.7 | -107 | .... | 13.73 | 13.99 | ..... | ..... |
| ρ | -45 | -3.2 | -71 | 4.5 | 14.7 | 15.0 | ..... | ..... |
| φ | -29 | -2.0 | -42 | 3.5 | 15.13 | 15.39 | ..... | ..... |
| A | -20 | -1.4 | -5 | .... | ..... | ..... | 16.2 \pm | 16.5 \pm |
| σ | -4 | -0.3 | -152 | 14. | 14.1 | 14.4 | ..... | ..... |
| μ | +6 | +0.4 | -12 | 2. | 15.32 | 15.58 | ..... | ..... |
| σ' | +17 | +1.4 | -157 | .... | 14.4 | 14.7 | ..... | ..... |
| π | +48 | +3.3 | +39 | 4. | 15.2 | 15.5 | ..... | ..... |
| τ | +103 | +7.2 | -164 | 16. | 13.6 | 13.9 | ..... | ..... |
| γ | +104 | +7.3 | +41 | 20. | 13.50 | 13.76 | ..... | ..... |
| h | +190 | +13.5 | +45 | 30.8 | ..... | ..... | 11.63 | 11.89 |
| b | +202 | +14.3 | -8 | 28.8 | ..... | ..... | 11.94 | 12.20 |
| e | +232 | +16.4 | -64 | 33.2 | ..... | ..... | 11.30 | 11.56 |
| ε | ... | -195. | +660 | 55.2 | ..... | ..... | 7.81 | 8.1 |
| ν | ... | -178. | +1380 | 56.3 | ..... | ..... | 7.7 | 8.0 |

Table 92 gives the determination of the magnitude of the stars m' , n' , x , and δ , based on the fundamental stars F , G , and K . No correction has been made for change of atmospheric absorption depending on difference of zenith distance between the fundamental and measured stars, as it amounted to only 0.002 mag. Table 92 also gives the measures of a , c , d , f , g , and l , with the 12-inch and the fainter stars with the 40-inch.

In Table 94 the separate results are collected and the mean magnitudes found. The residuals for each night's measures are given in the column headed Δ , the mean values being—

With the 6-inch..... ± 0.08
 With the 12-inch..... ± 0.05
 With the 40-inch..... ± 0.12

VISUAL COMPARISONS OF THE VARIABLE.

Table 95 gives in detail the visual comparisons of the variable by Argelander's method with the comparison stars thus determined. There are also included for comparison the photometric measures of the variable in observations Nos. 112 and 115, and estimates from the photograph, Nos. 114 and 123.

TABLE 92.—7458 V DELPHINI. PHOTOMETER MEASURES OF COMPARISON STARS.

| 1903 October 22. | | | 6-INCH. | | | | Good. | |
|------------------|------------|-----------------------|-----------------|----------------------|------------|-------|-------------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 21 6 | 25 | <i>F</i> | 12.9 12.8 12.8 | 12.83 | 12.62 | 0.59 | 6.96 | 7.22 |
| | | <i>G</i> | 17.6 16.8 16.9 | 17.10 | 17.14 | 1.25 | 7.62 | 7.88 |
| | | <i>K</i> | 13.5 13.6 13.7 | 13.60 | 13.62 | 0.74 | 7.11 | 7.37 |
| | | <i>x</i> | 32.5 32.7 32.8 | 32.67 | 32.90 | 3.04 | 9.41 | 9.67 |
| | | <i>m'</i> | 36.6 36.8 37.0 | 36.80 | 36.35 | 3.50 | 9.87 | 10.13 |
| | | <i>n'</i> | 36.5 36.1 36.0 | 36.20 | 35.70 | 3.42 | 9.79 | 10.05 |
| | | <i>δ</i> | 32.7 32.0 32.1 | 32.27 | 31.97 | 2.92 | 9.29 | 9.55 |
| | | <i>δ</i> | 50.2 50.7 50.2 | 50.37 | ..... | 4.73 | 11.10 | 11.36 |
| | | <i>δ</i> | 31.9 32.1 31.0 | 31.67 | ..... | ..... | ..... | ..... |
| | | <i>n'</i> | 35.2 35.4 35.0 | 35.20 | ..... | ..... | ..... | ..... |
| | | <i>m'</i> | 36.1 36.2 35.4 | 35.90 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 33.2 33.0 33.2 | 33.13 | ..... | ..... | ..... | ..... |
| | | <i>K</i> | 13.4 13.9 13.6 | 13.63 | ..... | ..... | ..... | ..... |
| | | <i>G</i> | 17.1 17.4 17.0 | 17.17 | ..... | ..... | ..... | ..... |
| | | <i>F</i> | 12.5 12.3 12.4 | 12.40 | ..... | ..... | ..... | ..... |
| 21 32 | 26 | <i>F</i> | | | | | | |
| 1903 October 23. | | | | | | | | |
| | | | | | | | Good. | |
| 21 4 | 26 | <i>δ</i> | 28.6 28.8 28.9 | 28.77 | 29.72 | 2.66 | 9.22 | 9.48 |
| | | <i>n'</i> | 32.1 32.7 32.6 | 32.47 | 32.32 | 2.97 | 9.53 | 9.79 |
| | | <i>m'</i> | 33.1 32.9 33.3 | 33.10 | 32.70 | 3.01 | 9.57 | 9.83 |
| | | <i>x</i> | 31.3 31.4 31.5 | 31.40 | 30.34 | 2.72 | 9.28 | 9.54 |
| | | <i>K</i> | 12.5 12.3 12.1 | 12.30 | 12.14 | 0.52 | 7.08 | 7.34 |
| | | <i>G</i> | 15.9 15.3 15.7 | 15.63 | 15.45 | 0.99 | 7.55 | 7.81 |
| | | <i>F</i> | 12.1 11.8 11.8 | 11.90 | 11.82 | 0.49 | 7.05 | 7.31 |
| | | <i>F</i> | 10.7 11.1 10.4 | 10.73 | ..... | ..... | ..... | ..... |
| | | <i>G</i> | 15.1 15.2 15.5 | 15.27 | ..... | ..... | ..... | ..... |
| | | <i>K</i> | 11.5 12.1 12.3 | 11.97 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 28.9 29.9 29.0 | 29.27 | ..... | ..... | ..... | ..... |
| | | <i>m'</i> | 31.7 32.7 32.5 | 32.30 | ..... | ..... | ..... | ..... |
| | | <i>n'</i> | 32.0 32.2 32.3 | 32.17 | ..... | ..... | ..... | ..... |
| | | <i>δ</i> | 31.0 30.2 30.8 | 30.67 | ..... | ..... | ..... | ..... |
| 21 24 | 27 | <i>δ</i> | | | | | | |
| 1903 October 24. | | | | | | | Good, small moon. | |
| 20 47 | 23 | <i>F</i> | 10.7 10.7 11.0 | 10.80 | 10.74 | 0.28 | 6.97 | 7.23 |
| | | <i>F_{a1}</i> | 15.7 16.0 16.6 | 16.10 | 16.67 | 1.17 | 7.86 | 8.12 |
| | | <i>G</i> | 13.9 14.4 13.7 | 14.00 | 14.02 | 0.80 | 7.49 | 7.75 |
| | | <i>K</i> | 11.6 12.1 11.7 | 11.80 | 11.59 | 0.46 | 7.15 | 7.41 |
| | | <i>x</i> | 30.5 30.7 30.1 | 30.43 | 30.67 | 2.76 | 9.45 | 9.71 |
| | | <i>m'</i> | 31.6 31.7 32.1 | 31.80 | 32.00 | 2.94 | 9.63 | 9.89 |
| | | <i>n'</i> | 32.2 32.0 32.0 | 32.07 | 31.89 | 2.91 | 9.60 | 9.86 |
| | | <i>δ</i> | 30.2 29.2 29.7 | 29.70 | 29.99 | 2.68 | 9.37 | 9.63 |
| | | <i>δ</i> | 30.6 30.1 30.1 | 30.27 | ..... | ..... | ..... | ..... |
| | | <i>n'</i> | 32.1 31.7 31.3 | 31.70 | ..... | ..... | ..... | ..... |
| | | <i>m'</i> | 32.2 32.0 32.4 | 32.20 | ..... | ..... | ..... | ..... |
| | | <i>x</i> | 30.5 31.0 31.2 | 30.90 | ..... | ..... | ..... | ..... |
| | | <i>K</i> | 11.3 11.5 11.3 | 11.37 | ..... | ..... | ..... | ..... |
| | | <i>G</i> | 14.4 14.3 13.4 | 14.03 | ..... | ..... | ..... | ..... |
| | | <i>F</i> | 10.6 10.7 10.7 | 10.67 | ..... | ..... | ..... | ..... |
| 21 8 | 24 | <i>F_{a1}</i> | 17.2 17.4 17.1 | 17.23 | ..... | ..... | ..... | ..... |

TABLE 92.—7458 V DELPHINI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1903 October 25. | | | 12-INCH. | | | | Fair to good. | | |
|-------------------|------------|-----------|-----------------|----------------------|------------|-------|---------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3 | Mean of 6. | | H. | P. | |
| <i>h m</i> | <i>°</i> | | | | | | | | |
| 23 15 | 40 | <i>x</i> | 21.0 21.8 21.3 | 21.37 | 21.89 | 1.91 | 9.32 | 9.58 | |
| | | <i>m'</i> | 24.9 25.8 25.2 | 25.30 | 26.52 | 2.33 | 9.74 | 10.00 | |
| | | <i>n'</i> | 27.4 28.2 27.9 | 27.83 | 27.40 | 2.40 | 9.81 | 10.07 | |
| | | <i>δ</i> | 19.8 20.1 20.3 | 20.87 | 20.00 | 1.71 | 9.12 | 9.38 | |
| | | <i>l</i> | 43.3 44.0 44.5 | 43.93 | ..... | 4.20 | 11.61 | 11.87 | |
| | | <i>g</i> | 38.0 37.7 38.1 | 37.93 | 37.97 | 3.54 | 10.95 | 11.21 | |
| | | <i>a</i> | 49.9 50.2 49.0 | 49.70 | 49.69 | 4.77 | 12.18 | 12.44 | |
| | | <i>f</i> | 38.8 37.9 38.0 | 38.23 | 38.68 | 3.62 | 11.03 | 11.29 | |
| | | <i>c</i> | 40.0 39.3 39.2 | 39.50 | ..... | 3.72 | 11.13 | 11.39 | |
| | | <i>d</i> | 38.7 37.7 38.2 | 38.20 | ..... | 3.57 | 10.98 | 11.24 | |
| | | <i>f</i> | 39.4 39.0 39.0 | 39.13 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 49.1 50.0 49.9 | 49.67 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 38.2 38.0 37.8 | 38.00 | ..... | ..... | ..... | ..... |  |
| | | <i>δ</i> | 20.1 19.7 20.0 | 19.93 | ..... | ..... | ..... | ..... |  |
| | | <i>n'</i> | 26.9 27.0 27.0 | 26.97 | ..... | ..... | ..... | ..... |  |
| | | <i>m'</i> | 28.2 27.7 27.3 | 27.73 | ..... | ..... | ..... | ..... |  |
| 23 45 | 45 | <i>x</i> | 21.9 23.0 22.3 | 22.40 | ..... | ..... | ..... | ..... |  |
| 1903 October 26. | | | Good, moon. | | | | | | |
| 21 3 | 24 | <i>δ</i> | 18.2 18.7 19.0 | 18.63 | 18.48 | 1.50 | 9.12 | 9.38 | |
| | | <i>n'</i> | 24.6 25.3 24.9 | 24.93 | 24.30 | 2.15 | 9.77 | 10.03 | |
| | | <i>m'</i> | 25.0 26.0 25.4 | 25.47 | 25.00 | 2.20 | 9.82 | 10.08 | |
| | | <i>x</i> | 20.1 19.9 20.1 | 20.03 | 19.85 | 1.68 | 9.30 | 9.56 | |
| | | <i>d</i> | 38.3 38.3 38.8 | 38.47 | 37.49 | 3.48 | 11.10 | 11.36 | |
| | | <i>c</i> | 40.8 40.7 40.9 | 40.80 | 40.29 | 3.80 | 11.42 | 11.68 | |
| | | <i>f</i> | 37.2 37.0 37.2 | 37.13 | 36.82 | 3.40 | 11.02 | 11.28 | |
| | | <i>a</i> | 46.7 48.0 47.1 | 47.27 | 47.27 | 4.55 | 12.17 | 12.43 | |
| | | <i>g</i> | 36.7 37.6 37.0 | 37.10 | 36.75 | 3.40 | 11.02 | 11.28 | |
| | | <i>l</i> | 41.1 42.0 41.0 | 41.37 | 41.62 | 3.96 | 11.58 | 11.84 | |
| | | <i>l</i> | 41.6 41.9 42.1 | 41.87 | ..... | ..... | ..... | ..... |  |
| | | <i>g</i> | 37.4 35.4 36.4 | 36.40 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 46.7 47.8 47.3 | 47.27 | ..... | ..... | ..... | ..... |  |
| | | <i>f</i> | 36.9 36.0 36.6 | 36.50 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 40.2 40.0 39.1 | 39.77 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 36.8 36.3 36.4 | 36.50 | ..... | ..... | ..... | ..... |  |
| | | <i>x</i> | 19.8 19.3 19.9 | 19.67 | ..... | ..... | ..... | ..... |  |
| | | <i>m'</i> | 24.7 24.2 24.7 | 24.53 | ..... | ..... | ..... | ..... |  |
| | | <i>n'</i> | 23.7 23.6 23.7 | 23.67 | ..... | ..... | ..... | ..... |  |
| 21 31 | 26 | <i>δ</i> | 18.2 18.3 18.5 | 18.33 | ..... | ..... | ..... | ..... |  |
| 1903 November 10. | | | Good. | | | | | | |
| 21 38 | 26 | <i>δ</i> | 11.2 12.1 12.2 | 11.83 | 12.43 | 0.71 | 9.05 | 9.31 | |
| | | <i>n'</i> | 18.0 18.7 18.8 | 18.50 | 18.70 | 1.55 | 9.89 | 10.15 | |
| | | <i>m'</i> | 16.7 17.7 17.2 | 17.20 | 17.99 | 1.45 | 9.79 | 10.05 | |
| | | <i>x</i> | 14.3 13.1 13.8 | 13.73 | 14.00 | 0.91 | 9.25 | 9.51 | |
| | | <i>d</i> | 30.8 30.9 31.8 | 31.17 | 30.84 | 2.74 | 11.08 | 11.34 | |
| | | <i>c</i> | 33.8 34.0 33.3 | 33.70 | 33.74 | 3.05 | 11.39 | 11.65 | |
| | | <i>f</i> | 30.8 30.0 30.1 | 30.30 | 30.67 | 2.72 | 11.06 | 11.32 | |
| | | <i>a</i> | 41.1 40.0 40.4 | 40.50 | 39.27 | 3.70 | 12.04 | 12.30 | |
| | | <i>g</i> | 28.5 29.0 28.2 | 28.57 | 28.79 | 2.53 | 10.87 | 11.13 | |
| | | <i>l</i> | 36.0 37.0 36.2 | 36.40 | ..... | 3.35 | 11.69 | 11.95 | |
| | | <i>g</i> | 28.9 29.2 28.9 | 29.00 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 38.1 38.0 38.0 | 38.03 | ..... | ..... | ..... | ..... |  |
| | | <i>f</i> | 31.0 30.9 31.2 | 31.03 | ..... | ..... | ..... | ..... |  |
| | | <i>c</i> | 33.2 33.9 34.2 | 33.77 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 30.0 30.8 30.7 | 30.50 | ..... | ..... | ..... | ..... |  |
| | | <i>x</i> | 14.2 14.3 14.3 | 14.27 | ..... | ..... | ..... | ..... |  |
| | | <i>m'</i> | 18.7 19.0 18.6 | 18.77 | ..... | ..... | ..... | ..... |  |
| | | <i>n'</i> | 19.0 18.6 19.1 | 18.90 | ..... | ..... | ..... | ..... |  |
| 22 2 | 29 | <i>δ</i> | 12.2 13.8 13.1 | 13.03 | ..... | ..... | ..... | ..... |  |

TABLE 92.—7458 V DELPHINI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1900 July 26. | | | 40-INCH, WEDGE II. | | | | Twilight. | |
|--------------------|------------|-----------|---------------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | <i>d</i> | 18.5 18.3 18.3 18.8 | 18.48 | 16.48 | 0.92 | 10.84 | 11.10 |
| | | <i>c</i> | 23.2 22.2 23.2 22.2 | 22.70 | 21.72 | 1.77 | 11.69 | 11.95 |
| | | <i>f</i> | 18.2 19.8 16.8 16.7 | 18.13 | 16.39 | 0.91 | 10.83 | 11.09 |
| | | <i>a</i> | 27.8 25.1 25.5 26.9 | 26.33 | 24.93 | 2.23 | 12.15 | 12.41 |
| | | <i>γ</i> | 36.0 37.5 35.5 36.2 | 36.30 | ..... | 3.52 | 13.44 | 13.70 |
| | | <i>l</i> | 20.1 19.9 | 20.00 | ..... | 1.5 | 11.4 | 11.7 |
| | | <i>g</i> | 14.5 16.2 | 15.35 | ..... | 0.72 | 10.6 | 10.9 |
| | | <i>a</i> | 22.5 23.9 22.8 24.9 | 23.53 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 13.2 14.8 14.9 15.7 | 14.65 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 19.8 20.9 19.9 18.3 | 19.73 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 14.2 15.0 13.9 14.8 | 14.48 | ..... | ..... | ..... | ..... |
| 1900 August 30. | | | | | | | | |
| 19 50 | | <i>f</i> | 16.5 16.5 17.2 | 16.73 | 15.03 | 0.71 | 10.87 | 11.13 |
| | | <i>a</i> | 27.0 27.2 24.9 | 26.37 | 24.17 | 2.13 | 12.29 | 12.55 |
| | | <i>γ</i> | 31.8 32.1 33.3 | 32.40 | 33.29 | 3.22 | 13.38 | 13.64 |
| | | <i>π</i> | 52.0 50.0 50.9 | 50.97 | 50.89 | 5.03 | 15.19 | 15.45 |
| | | <i>μ</i> | 49.9 54.7 53.6 | 52.73 | 52.08 | 5.13 | 15.29 | 15.55 |
| | | <i>ρ</i> | 51.1 52.3 51.9 | 51.77 | 51.79 | 5.11 | 15.27 | 15.53 |
| | | <i>φ</i> | 46.8 | 46.8 | ..... | 4.7± | 14.9± | 15.1± |
| | | <i>ω</i> | 36.1 38.5 36.8 | 37.13 | ..... | 3.62 | 13.78 | 14.04 |
| | | <i>l'</i> | 53.0 50.2 52.2 | 51.80 | ..... | ..... | ..... | ..... |
| | | <i>μ</i> | 50.3 50.9 53.1 | 51.43 | ..... | ..... | ..... | ..... |
| | | <i>π</i> | 50.9 49.8 51.7 | 50.80 | ..... | ..... | ..... | ..... |
| | | <i>γ</i> | 33.3 35.2 34.0 | 34.17 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 23.2 20.9 21.8 | 21.97 | ..... | ..... | ..... | ..... |
| 20 20 | | <i>j</i> | 12.4 15.0 12.6 | 13.33 | ..... | ..... | ..... | ..... |
| 1900 September 6. | | | | | | | | |
| Moon too bright. | | | | | | | | |
| 21 47 | | <i>d</i> | 15.2 16.2 15.6 | 15.67 | ..... | 0.80 | 10.95 | 11.21 |
| | | <i>c</i> | 18.9 19.9 20.1 | 19.63 | ..... | 1.43 | 11.58 | 11.84 |
| | | <i>f</i> | 16.0 12.0 14.4 | 14.13 | ..... | 0.58 | 10.73 | 10.99 |
| | | <i>a</i> | 22.0 24.2 25.7 | 23.97 | ..... | 2.10 | 12.25 | 12.51 |
| | | <i>γ</i> | 37.9 34.3 35.0 | 35.73 | ..... | 3.46 | 13.61 | 13.87 |
| 22 5 | | <i>ω</i> | 38.9 39.6 37.7 | 38.73 | ..... | 3.79 | 13.94 | 14.20 |
| 1900 September 13. | | | | | | | | |
| Good. | | | | | | | | |
| 22 22 | | <i>d</i> | 16.5 15.1 15.9 | 15.83 | 15.70 | 0.80 | 11.04 | 11.30 |
| | | <i>c</i> | 19.2 18.2 17.8 | 18.40 | 18.09 | 1.21 | 11.45 | 11.71 |
| | | <i>f</i> | 12.0 11.8 12.3 | 12.03 | 12.88 | 0.40 | 10.64 | 10.90 |
| | | <i>a</i> | 25.0 25.9 23.4 | 24.77 | 24.39 | 2.16 | 12.40 | 12.66 |
| | | <i>γ</i> | 35.2 35.7 32.5 | 34.47 | 34.32 | 3.32 | 13.56 | 13.82 |
| | | <i>μ</i> | 52.1 52.0 51.9 | 52.00 | ..... | 5.12 | 15.36 | 15.62 |
| | | <i>ρ</i> | 47.5 46.9 47.8 | 47.40 | ..... | 4.75 | 14.99 | 15.25 |
| | | <i>φ</i> | 43.0 ..... .. | ..... | ..... | 4.3± | 14.5± | 14.8± |
| | | <i>ω'</i> | 41.0 ..... .. | ..... | ..... | 4.1± | 14.3± | 14.6± |
| | | <i>σ</i> | 30.5 ..... .. | ..... | ..... | 2.9± | 13.1± | 13.4± |
| | | <i>σ'</i> | 39.8 ..... .. | ..... | ..... | 3.9± | 14.1± | 14.4± |
| | | <i>τ</i> | 42.7 ..... .. | ..... | ..... | 4.2± | 14.4± | 14.7± |
| | | <i>γ</i> | 37.7 ..... .. | ..... | ..... | 3.7± | 13.9± | 14.2± |
| | | <i>a</i> | 34.8 33.9 33.8 | 34.17 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 23.8 24.2 24.0 | 24.00 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 11.0 11.9 11.1 | 11.33 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 13.2 14.5 13.5 | 13.73 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 17.1 19.0 17.2 | 17.77 | ..... | ..... | ..... | ..... |
| 22 57 | | | 14.9 16.6 15.2 | 15.57 | ..... | ..... | ..... | ..... |

TABLE 93.—7458 DELPHINI. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|---------------------|------------------|-----------|------|--------|-------|------------------|-----------|------|--------|-------|------------------|-----------|------|--------|-------|
| Star. | 1903 October 22. | | | | | 1903 October 23. | | | | | 1903 October 24. | | | | |
| | C. | Obs. Mag. | | J Mag. | | C. | Obs. Mag. | | J Mag. | | C. | Obs. Mag. | | J Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| F..... | 0.59 | 6.96 | 7.22 | -.11 | +.11 | 0.49 | 7.05 | 7.31 | -.02 | +.20 | 0.36 | 6.97 | 7.23 | -.10 | +.12 |
| G..... | 1.25 | 7.62 | 7.88 | +.41 | -.06 | 0.99 | 7.55 | 7.81 | +.33 | -.14 | 0.80 | 7.49 | 7.75 | +.27 | -.20 |
| K..... | 0.74 | 7.11 | 7.37 | -.29 | -.03 | 0.52 | 7.08 | 7.34 | -.32 | -.06 | 0.46 | 7.15 | 7.41 | -.25 | -.01 |
| Means.. | 0.86 | 7.23 | 7.49 | ±.27 | ±.07 | 0.67 | 7.23 | 7.49 | ±.22 | ±.13 | 0.54 | 7.23 | 7.49 | ±.21 | ±.11 |
| M ₀.... | .... | 6.37 | 6.63 | ..... | ..... | ..... | 6.56 | 6.82 | ..... | ..... | ..... | 6.69 | 6.95 | ..... | ..... |

| 12-INCH. | | | | | 40-INCH. | | | | | |
|----------------------|-----------------|----------|----------|----------|----------------------|------------------|----------|----------|----------|-----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | | |
| | | Oct. 25. | Oct. 26. | Nov. 10. | | | July 26. | Aug. 30. | Sept. 6. | Sept. 13. |
| m'..... | 9.69 | 2.33 | 2.20 | 1.45 | a..... | 12.13 | 2.23 | 2.13 | 2.10 | 2.16 |
| n'..... | 9.64 | 2.40 | 2.15 | 1.55 | c..... | 11.31 | 1.77 | .... | 1.43 | 1.21 |
| x..... | 9.38 | 1.91 | 1.68 | 0.91 | d..... | 11.05 | 0.92 | .... | 0.80 | 0.80 |
| δ..... | 9.29 | 1.71 | 1.50 | 0.71 | f..... | 11.04 | 0.91 | 0.71 | 0.58 | 0.40 |
| Mean C... | ..... | 2.09 | 1.88 | 1.16 | Mean C... | ..... | 1.46 | 1.42 | 1.23 | 1.14 |
| Mean Mag. | 9.50 | 9.50 | 9.50 | 9.50 | Mean Mag. | 11.84 | 11.38 | 11.58 | 11.38 | 11.38 |
| M ₀..... | .... | 7.41 | 7.62 | 8.34 | M ₀..... | ..... | 9.92 | 10.16 | 10.15 | 10.24 |

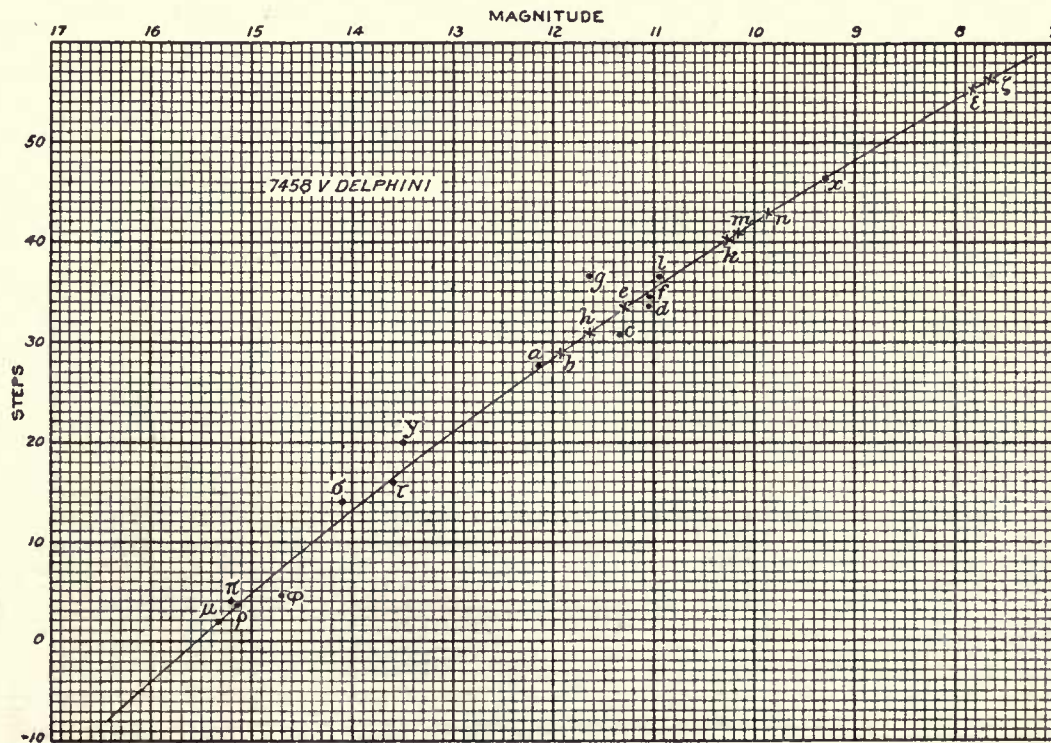


FIG. 31.—MAGNITUDE-CURVE FOR V DELPHINI.

TABLE 94.—7458 V DELPHINI. MEAN MAGNITUDES OF COMPARISON STARS.*

| 6-INCH. | | | | | | | | | | | |
|-----------------|-------------|---------------|-------------|---------------|--------------|---------------|---------------|---------------|------------|------------|---------------|
| Star. | October 22. | | October 23. | | October 24. | | Mag. | Δ Mag. | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | | | Mag. H. | Mag. P. | Δ Mag. |
| <i>F</i> | 6.96 | -0.06 | 7.05 | +0.03 | 7.04 | +0.02 | ..... | ..... | 7.02 | 7.28 | ± 0.04 |
| <i>G</i> | 7.62 | +0.07 | 7.55 | 0.00 | 7.49 | +0.06 | ..... | ..... | 7.55 | 7.81 | ± 0.04 |
| <i>K</i> | 7.11 | 0.00 | 7.08 | -0.03 | 7.15 | +0.04 | ..... | ..... | 7.11 | 7.37 | ± 0.02 |
| Mean..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7.23 | 7.49 | ± 0.03 |
| <i>m'</i> | 9.87 | +0.18 | 9.57 | -0.12 | 9.63 | -0.06 | ..... | ..... | 9.69 | 9.95 | ± 0.12 |
| <i>n'</i> | 9.79 | +0.15 | 9.53 | -0.11 | 9.60 | -0.04 | ..... | ..... | 9.64 | 9.90 | ± 0.10 |
| <i>x</i> | 9.41 | +0.03 | 9.28 | -0.10 | 9.45 | +0.07 | ..... | ..... | 9.38 | 9.64 | ± 0.07 |
| δ | 9.29 | 0.00 | 9.22 | -0.07 | 9.37 | +0.08 | ..... | ..... | 9.29 | 9.55 | ± 0.05 |
| Mean..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9.50 | 9.76 | ± 0.07 |
| 12-INCH. | | | | | | | | | | | |
| Star. | October 25. | | October 26. | | November 10. | | Mag. | Δ Mag. | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | | | Mag. H. | Mag. P. | Δ Mag. |
| <i>m'</i> | 9.74 | -0.04 | 9.82 | +0.04 | 9.79 | +0.01 | ..... | ..... | 9.78 | 10.04 | ± 0.03 |
| <i>n'</i> | 9.81 | -0.01 | 9.77 | -0.05 | 9.89 | +0.07 | ..... | ..... | 9.82 | 10.08 | ± 0.04 |
| <i>x</i> | 9.32 | +0.03 | 9.30 | +0.01 | 9.25 | -0.04 | ..... | ..... | 9.29 | 9.55 | ± 0.03 |
| δ | 9.12 | +0.02 | 9.12 | +0.02 | 9.05 | -0.05 | ..... | ..... | 9.10 | 9.36 | ± 0.03 |
| Mean..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9.50 | 9.76 | ± 0.03 |
| <i>a</i> | 12.18 | +0.05 | 12.17 | +0.04 | 12.04 | -0.09 | ..... | ..... | 12.13 | 12.39 | ± 0.06 |
| <i>c</i> | 11.13 | -0.18 | 11.42 | +0.11 | 11.39 | +0.08 | ..... | ..... | 11.31 | 11.57 | ± 0.12 |
| <i>d</i> | 10.98 | -0.07 | 11.10 | +0.05 | 11.08 | +0.03 | ..... | ..... | 11.05 | 11.34 | ± 0.05 |
| <i>f</i> | 11.03 | -0.01 | 11.02 | -0.02 | 11.06 | +0.02 | ..... | ..... | 11.04 | 11.32 | ± 0.02 |
| <i>g</i> | 10.95 | 0.00 | 11.02 | +0.07 | 10.87 | -0.08 | ..... | ..... | 10.95 | 11.13 | ± 0.05 |
| <i>l</i> | 11.61 | -0.02 | 11.58 | -0.05 | 11.69 | +0.06 | ..... | ..... | 11.63 | 11.95 | ± 0.04 |
| Mean..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11.35 | 11.61 | ± 0.06 |
| 40-INCH. | | | | | | | | | | | |
| Star. | July 26. | | August 30. | | September 6. | | September 13. | | Mean. | | |
| | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. | Δ Mag. | Mag. H. | Mag. P. | Δ Mag. |
| <i>a</i> | 12.15 | -0.12 | 12.29 | +0.02 | 12.25 | -0.02 | 12.40 | +0.13 | 12.37 | 12.53 | ± 0.07 |
| <i>c</i> | 11.69 | +0.12 | ..... | ..... | 11.58 | +0.01 | 11.45 | +0.12 | 11.57 | 11.83 | ± 0.08 |
| <i>d</i> | 10.84 | -0.10 | ..... | ..... | 10.95 | +0.01 | 11.04 | +0.10 | 10.94 | 11.20 | ± 0.07 |
| <i>f</i> | 10.83 | +0.06 | 10.87 | +0.10 | 10.73 | -0.04 | 10.64 | -0.13 | 10.77 | 11.03 | ± 0.08 |
| Mean..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11.38 | 11.64 | ± 0.08 |
| <i>y</i> | 13.44 | -0.06 | 13.38 | -0.12 | 13.61 | +0.11 | 13.56 | +0.06 | 13.50 | 13.76 | ± 0.09 |
| ϕ..... | ..... | ..... | 14.9\pm | ..... | ..... | ..... | 14.5\pm | ..... | 14.7 \pm | 15.0\pm | ..... |
| μ..... | ..... | ..... | 15.29 | -0.03 | ..... | ..... | 15.36 | +0.04 | 15.32 | 15.58 | ± 0.04 |
| π..... | ..... | ..... | 15.19 | ..... | ..... | ..... | ..... | ..... | 15.2 \pm | 15.5\pm | ..... |
| ρ..... | ..... | ..... | 15.27 | +0.14 | ..... | ..... | 14.99 | -0.14 | 15.13 | 15.39 | ± 0.14 |
| ω..... | ..... | ..... | 13.78 | +0.05 | 13.94 | +0.21 | 13.1\pm | ..... | 13.73 | 13.99 | ..... |
| ω'..... | ..... | ..... | ..... | ..... | ..... | ..... | 14.3\pm | ..... | 14.3 \pm | 14.6\pm | ..... |
| σ..... | ..... | ..... | ..... | ..... | ..... | ..... | 14.1\pm | ..... | 14.1 \pm | 14.4\pm | ..... |
| σ'..... | ..... | ..... | ..... | ..... | ..... | ..... | 14.4\pm | ..... | 14.4 \pm | 14.7\pm | ..... |

TABLE 95.—7458 V DELPHINI. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|--|---------------------------|--------|--------|---------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1894 June 28 | 10 | 2410000+ 3008.67 | 150 | 6 | {g1f, f2e, ec, e2d, d3b. } {c2a, h2b, e3k, limit 1 < a. . . . . } |  | .... | < 12 | .... | ... | .... |
| 2 | 30 | 10 | 3010.67 | 150 | 6 | e3h, h2b, g2e, g3f, e1f, ab. . . . . |  | .... | < 12 | .... | ... | .... |
| 3 | July 6 | 10 | 3016.67 | 150 | 6 | f2c, c1d, d3e, e4-5a, ab. . . . . |  | .... | < 12 | .... | ... | .... |
| 4 | 23 | 10 | 3033.67 | 150 | 6 | c1-2a, g2f, g3d. . . . . |  | .... | < 12 | .... | ... | .... |
| 5 | Aug. 6 | 10 | 3047.67 | 150 | 6 | nothing visible in place of v. . . . . |  | .... | .... | .... | ... | .... |
| 6 | Nov. 20 | 6 | 3153.50 | 150 | 6 | f1d, d2c, c3a, b1a, limit a. . . . . |  | .... | < 12 | .... | ... | .... |
| 7 | Dec. 2 | 6 | 3165.50 | 150 | 6 | c2a, a0-1b. . . . . |  | .... | < 12 | .... | ... | .... |
| 8 | 13 | 6 | 3176.50 | 150 | 6 | {b2a, f2d, d3c, c2b. } {b1-2a, limit a. . . . . } |  | .... | < 12 | .... | ... | .... |
| 9 | 19 | 6 | 3182.50 | 150 | 6 | f1d, d3-4c, c4a, b2a. . . . . |  | .... | < 12 | .... | ... | .... |
| 10 | 25 | 6 | 3188.50 | 150 | 6 | c2-3a, b1a. . . . . |  | .... | < 12 | .... | ... | .... |
| 11 | 1895 Jan. 15 | 6 | 3209.50 | 150 | 6 | c2-3a, limit a. . . . . |  | .... | < 12 | .... | ... | .... |
| 12 | Feb. 21 | .. | 3246. . | 150 | 6 | a3d, a4c. . . . . |  | .... | < 12 | .... | ... | .... |
| 13 | May 26 | 10 | 3340.67 | 150 | 6 | {a is not the var. v is in line {cae, v3l, k4v. } | 39.6, 36.2. | 37.9 | 10.61 | good | 6 | +0.82 |
| 14 | June 13 | 10 | 3358.67 | 150 | 6 | v1, v1-2f, v2-3d. | 36.6, 36.0, 36.0. | 36.2 | 10.92 | good | 24 | +1.26 |
| 15 | 26 | 10 | 3371.67 | 150 | 6 | f2v, v2c. | 32.5, 32.9. | 32.7 | 11.40 | good | 37 | +1.50 |
| 16 | July 9 | 9 | 3384.63 | 150 | 6 | l5v, f3v, v4a. | 31.6, 31.5, 31.6. | 31.5 | 11.57 | fair | 50 | +1.37 |
| 17 | 19 | 9 | 3394.63 | 150 | 6 | f3v, v3a. | 31.5, 30.6. | 31.0 | 11.63 | fair | 60 | +1.23 |
| 18 | 24 | 9 | 3399.63 | 150 | 6 | d2v, v1c, f5v, v3a. | 31.5, 31.9, 29.5, 30.6 | 30.9 | 11.66 | fair | 65 | +1.14 |
| 19 | 30 | 9 | 3405.63 | 150 | 6 | c4v, v1-2a. | 26.9, 29.1. | 28.0 | 12.03 | moon | 71 | +1.23 |
| 20 | Aug. 12 | 9 | 3418.60 | 150 | 6 | e7-8v, va. | 27.6, 26.7. | 27.1 | 12.15 | good | 84 | +1.17 |
| 21 | 25 | 8 | 3431.58 | 150 | 6 | a2v, limit v. | | 25.6 | 12.35 | fair | 97 | +1.08 |
| 22 | 26 | 9 | 3432.63 | 150 | 6 | a2v, limit v. | | 25.6 | 12.35 | good | 98 | +1.04 |
| 23 | Sept. 6 | 8 | 3443.58 | 150 | 6 | v not seen, limit c. . . . . |  | .... | < 11.4 | fair | ... | .... |
| 24 | 10 | 8 | 3447.58 | 40 | 6 | v not seen, limit 2 < a. . . . . |  | .... | < 12 | good | ... | .... |
| 25 | 1896 Aug. 10 | 9 | 3782.63 | 150 | 6 | v not seen, limit a. . . . . |  | .... | < 12 | fair | ... | .... |
| 26 | 26 | 8 | 3798.58 | 150 | 6 | v not seen, limit 2 < a. . . . . |  | .... | < 12 | good | ... | .... |
| 27 | Sept. 23 | .. | 3826. . | 80 | 6 | v not seen, limit a. . . . . |  | .... | < 12 | fair | ... | .... |
| 28 | Oct. 5 | 8 | 3838.58 | 150 | 6 | a2v, limit v. | | 25.6 | 12.36 | good | 504 | +1.20 |
| 29 | 24 | 6 | 3857.50 | 80 | 6 | vk, v1m, x3v. | 40.2, 41.9, 43.4. | 41.8 | 10.09 | fine | 523 | -0.10 |
| 30 | 26 | 8 | 3859.58 | 80 | 6 | x3v, v2k. | 43.4, 42.2. | 42.8 | 9.95 | fine | 525 | -0.15 |
| 31 | Nov. 1 | 8 | 3865.58 | 150 | 6 | x1v, v2k. | 44.9, 42.2. | 43.5 | 9.83 | good | 2 | -0.07 |
| 32 | 12 | 7 | 3876.54 | 150 | 6 | x1v, v6m, v5-6k. | 44.9, 45.7, 46.3. | 45.1 | 9.60 | good | 13 | -0.08 |
| 33 | 14 | 6 | 3878.50 | 150 | 6 | x1-2v, v5-6k, v3-4n. | 45.4, 46.9, 45.7. | 46.9 | 9.35 | good | 15 | -0.30 |
| 34 | 22 | 6 | 3886.50 | 150 | 6 | v0-1x. | 47.4. | 46.0 | 9.48 | good | 23 | -0.17 |
| 35 | 26 | 8 | 3890.58 | 40 | 6 | x1v, v2-3n. | 45.4, 45.0. | 46.3 | 9.45 | good | 27 | -0.26 |
| 36 | Dec. 2 | 8 | 3896.58 | 40 | 6 | x0-1v, v4n. | 45.9, 46.8. | 46.6 | 9.40 | good | 33 | -0.41 |
| 37 | 9 | 6 | 3903.50 | 150 | 6 | x1v, v5n. | 45.4, 47.8. | 44.2 | 9.77 | fair | 40 | -0.20 |
| 38 | 12 | 7 | 3906.54 | 80 | 6 | x2v. | 44.4. | 42.8 | 9.95 | fair | 43 | -0.10 |
| 39 | 20 | 7 | 3914.54 | 150 | 6 | x3v, v2n. | 43.4, 44.8. | 42.0 | 10.08 | poor | 51 | -0.13 |
| 40 | 1897 Jan. 6 | 6 | 3931.50 | 150 | 6 | x4v, v1n, v2k. | 42.4, 43.8, 42.2. | 42.8 | 9.95 | fair | 43 | -0.10 |
| 41 | 28 | 6 | 3953.50 | 150 | 6 | n2v, v2k. | 42.4, 42.8. | 42.0 | 10.08 | poor | 51 | -0.13 |
| 42 | May 28 | 10 | 4073.67 | ... | 6 | x4v, vn. | 40.8, 42.2. | 42.0 | 10.08 | poor | 51 | -0.13 |
| 43 | July 8 | 9 | 4114.63 | ... | .. | k3v, v5l, v6f. | 37.2, 41.6, 40.5. | 39.7 | 10.40 | fair | 68 | -0.21 |
| 44 | Aug. 27 | 9 | 4164.63 | ... | .. | vf. | | 34.5 | 11.11 | low | 90 | +0.01 |
| 45 | Oct. 14 | 7 | 4212.54 | ... | .. | v not seen, limit d. . . . . |  | .... | < 11.3 | low | ... | .... |
| | | | | | | v not seen, limit 2 < a. . . . . |  | .... | < 12.3 | moon | ... | .... |
| | | | | | | v not seen, limit 3-4 < a. . . . . |  | .... | < 12.6 | good | ... | .... |
| | | | | | | v not seen, limit 3 < a. . . . . |  | .... | < 12.5 | good | ... | .... |

TABLE 95.—7458 V DELPHINI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing | l. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|---|------------------------|--------|-------|--------|-----|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1898 | | 2410000+ | | | | | | | | | |
| 46 | Feb. 15 | 18 | 4337.00 | ... | .. | v not seen, limit a | ... | ... | <12.2 | good | ... | ... |
| 47 | Mar. 2 | 18 | 4352.00 | ... | .. | v not seen, limit f | ... | ... | <11.1 | fair | ... | ... |
| 48 | 15 | 17 | 4364.92 | ... | .. | v not seen, limit $1\frac{1}{2}M < k$ | ... | ... | <11.8 | fair | ... | ... |
| 49 | 23 | 17 | 4372.92 | 150 | 6 | v not seen, limit a | ... | ... | <12.2 | fair | ... | ... |
| 50 | April 1 | 16 | 4381.88 | 150 | 6 | v2a, f5v | 29.6, 29.5 | 29.5 | 11.83 | good | 518 | +1.43 |
| 51 | 15 | 16 | 4395.83 | 150 | 6 | v3f, v2l, v1d, k6v | 37.5, 38.6, 34.5, 34.2 | 36.7 | 10.83 | good | 3 | +0.95 |
| 52 | June 19 | 10 | 4460.67 | 150 | 6 | f1v, vic, vg | 33.5, 31.9, 36.4 | 33.9 | 11.21 | good | 68 | +0.61 |
| 53 | 21 | 13 | 4462.63 | ... | 12 | f1-2v, v1-2c | 33.0, 32.4 | 32.7 | 11.42 | ... | 70 | +0.78 |
| 54 | July 7 | 10 | 4478.67 | ... | 12 | d4v, c2-3v, v5a | 29.5, 28.4, 32.6 | 30.2 | 11.76 | good | 86 | +0.74 |
| 55 | 18 | 11 | 4489.71 | ... | 12 | d6v, v1a | 27.5, 28.6 | 28.0 | 12.03 | fair | 97 | +0.75 |
| 56 | Aug. 9 | 9 | 4511.63 | ... | 12 | a3-4v, v2-3y | 24.1, 22.5 | 23.3 | 12.67 | good | 119 | +0.85 |
| 57 | 17 | 9 | 4519.63 | 80 | 12 | a4-5v, v3y, limit y | 23.1, 23.0 | 23.2 | 12.68 | fair | 127 | +0.65 |
| | 1899 | | | | | | | | | | | |
| 58 | Jan. 9 | 6 | 4664.50 | 150 | 6 | v not seen, limit a | ... | ... | <12.2 | ... | ... | ... |
| 59 | Mar. 22 | 17 | 4736.96 | 150 | 6 | v not seen, limit a | ... | ... | <12.2 | ... | ... | ... |
| 60 | Apr. 16 | 16 | 4761.92 | 200 | 6 | v not seen, limit a | ... | ... | <12.2 | ... | ... | ... |
| 61 | May 10 | 15 | 4785.88 | 150 | 6 | v not seen, limit $1 < a$ | ... | ... | <12.3 | ... | ... | ... |
| 62 | 29 | 10 | 4804.67 | 150 | 6 | v not seen, limit a | ... | ... | <12.2 | ... | ... | ... |
| 63 | June 7 | 10 | 4813.67 | 150 | 6 | v not seen, limit $1 < a$ | ... | ... | <12.3 | fair | ... | ... |
| 64 | 10 | 15 | 4816.88 | 150 | 6 | v not seen, limit $2 < a$ | ... | ... | <12.4 | good | ... | ... |
| 65 | 26 | 10 | 4832.67 | 150 | 6 | v not seen, limit $2 < a$ | ... | ... | <12.5 | fair | ... | ... |
| 66 | July 8 | 10 | 4844.67 | 150 | 6 | v not seen, limit $4-5 < a$ | ... | ... | <12.7 | good | ... | ... |
| 67 | Aug. 10 | 9 | 4877.60 | 150 | 6 | v not seen, limit $2-3 < a$ | ... | ... | <12.4 | good | ... | ... |
| 68 | 22 | 9 | 4889.66 | 150 | 6 | v not seen, limit a | ... | ... | <12.2 | moon | ... | ... |
| 69 | 30 | 9 | 4897.60 | 150 | 6 | v4-5a, vg, f3-4v | 32.1, 36.4, 31.0 | 33.2 | 11.33 | good | 505 | +0.23 |
| 70 | Sept. 4 | 9 | 4902.60 | 150 | 6 | v5g, v4f, k2v, m2v | 41.4, 38.5, 39.9, 39.9 | 43.5 | 9.86 | good | 510 | -0.95 |
| 71 | 20 | 8 | 4918.56 | 40 | 6 | v4-5n, v2x, v1d | 48.4, 48.4, 48.4 | 56.8 | 7.83 | good | 526 | -2.26 |
| 72 | Oct. 2 | 8 | 4930.56 | 40 | 6 | v1 $\frac{1}{2}$ M > x, v2ε | 56.4, 57.2 | 57.1 | 7.80 | good | 9 | -1.93 |
| 73 | 6 | 8 | 4934.56 | 40 | 6 | v10x, v2-3ε | 56.4, 57.7 | 56.3 | 7.93 | good | 13 | -1.75 |
| 74 | 18 | 8 | 4946.56 | 80 | 6 | v10x, v1ε, vε | 56.4, 56.2, 56.3 | 52.4 | 8.52 | moon | 25 | -1.16 |
| 75 | 24 | 7 | 4952.54 | 40 | 6 | v6x | ... | 52.8 | 8.46 | good | 31 | -1.34 |
| 76 | Nov. 3 | 8 | 4962.58 | 40 | 6 | v8x±, ε4v | 54.4, 51.2 | 50.5 | 8.83 | fair | 41 | -1.17 |
| 77 | 8 | 7 | 4967.54 | 40 | 6 | ε5v, v4x | 50.7, 50.4 | 50.3 | 8.83 | good | 46 | -1.27 |
| 78 | 15 | 6 | 4974.50 | 40 | 6 | ε5-6v, v2-3x | 49.7, 48.9 | 49.3 | 8.97 | good | 53 | -1.30 |
| 79 | 22 | 7 | 4981.52 | 40 | 6 | ε6-8v, v1-2x | 48.2, 47.9 | 48.1 | 9.15 | fair | 60 | -1.26 |
| 80 | 26 | 6 | 4985.50 | 40 | 6 | ε6-8v, v2x | 48.2, 48.4 | 48.3 | 9.14 | fair | 64 | -1.36 |
| 81 | Dec. 7 | .. | 4996. | 150 | 6 | x2-3v | 43.9 | 44.8 | 9.85 | fair | 75 | -0.92 |
| 82 | 19 | 6 | 5008.50 | 150 | 6 | x2-3v, v4n | 43.9, 46.8 | 41.3 | 10.15 | good | 87 | -0.89 |
| 83 | 28 | 7 | 5017.52 | ... | .. | x6v, n1v, v5-6g | 40.4, 41.8, 41.9 | 39.0 | 10.50 | ... | 96 | -0.75 |
| | 1900 | | | | | | | | | | | |
| 84 | Jan. 4 | 6 | 5024.50 | 150 | 6 | n5v, vg, v2-3f | 37.8, 36.4, 37.0 | 37.0 | 10.78 | fair | 103 | -0.65 |
| 85 | 24 | 6 | 5044.50 | 150 | 6 | g4v, f1-2v, v1-2k | 32.4, 33.0 | 32.7 | 11.40 | poor | 123 | -0.52 |
| 86 | Mar. 2 | 14 | 5081.83 | 275 | 12 | a6v, v3-4y, limit y | 21.6, 23.5 | 22.7 | 12.74 | fair | 160 | -0.13 |
| 87 | May 1 | 16 | 5141.92 | 275 | 12 | v not seen, y glimpsed | ... | ... | <13 | fair | ... | ... |
| 88 | 3 | 14 | 5143.83 | ... | 40 | v is 1 to $1\frac{1}{2}M < y$, μ is $2M < y$ | ... | ... | 14.4 | ... | 222 | 0.0 |
| 89 | 11 | 15 | 5151.88 | 460 | 40 | v is 1 to $1\frac{1}{2}M < y$, $y3-4\pi$ | ... | ... | 14.58 | poor | 230 | -0.4± |
| 90 | June 8 | 15 | 5179.88 | 237 | 40 | μ seen, but nothing near v | ... | ... | ... | ... | ... | ... |
| 91 | 19 | 14 | 5190.83 | 350 | 40 | v not seen, limit $1M < y$ | ... | <2.0 | <14 | moon | ... | ... |
| 92 | 28 | 13 | 5199.79 | 237 | 40 | { $\mu0-1\pi$, $\pi4-5v$ } | ... | -0.5 | 15.44 | fair | 278 | -0.22 |
| 93 | July 20 | 12 | 5221.75 | 237 | 40 | v not seen, limit μ | ... | 3.0 | 15.08 | fine | 300 | -1.00 |
| 95 | 25 | 12 | 5226.75 | 460 | 40 | $\mu5-6v$ | ... | -3.5 | 16.0 | ... | 305 | -0.1± |
| 96 | Aug. 16 | 13 | 5248.79 | 460 | 40 | v not seen, limit μ | ... | ... | <15 | ... | ... | ... |
| 97 | 29 | 13 | 5261.79 | 700 | 40 | {v glimpsed, not steadily held} | ... | ... | 17.0± | fair | 340 | +0.4± |
| 98 | 30 | 10 | 5262.67 | 237 | 40 | {v is $1\frac{1}{2}$ to $2M < \mu$, and $\frac{1}{2}M < A$ } | ... | ... | <15 | moon | ... | ... |
| 99 | Sept. 6 | 9 | 5269.63 | 237 | 40 | v or A not seen | ... | ... | <13 | moon | ... | ... |

TABLE 95.—7458 V DELPHINI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|-----------------|---------------|---------------------|-------------------|----------------|--|---|------------|-------|---------|-------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 100 | 190 Sep t. 3 | 12 | 2410000+ 5276.75 | 237 | 40 | v not seen, limit μ..... | ..... | <15 | moon | ... | .... | .... |
| 101 | Oct. 4 | 10 | 5297.67 | 237 | 40 | v not seen, limit ω' or $4 < \gamma$..... | ..... | <14 | moon | ... | .... | .... |
| 102 | 16 | 9 | 5309.63 | 460 | 40 | { v suspected, not held, limit 1 μ < μ. } | ..... | <16 | good | ... | .... | .... |
| 103 | Dec. 11 | 6 | 5365.50 | 150 | 6 | v not seen, limit $4 < a$..... | ..... | <12.8 | .... | ... | .... | .... |
| 104 | 19 | 6 | 5373.50 | 150 | 6 | v not seen, limit $3 < a$..... | ..... | <12.5 | .... | ... | .... | .... |
| 105 | 1901 Oct. 18 | 8 | 5676.58 | 130 | 12 | v not seen, limit γ..... | ..... | <13 | moon | ... | .... | .... |
| 106 | Nov. 1 | 8 | 5690.58 | 275 | 12 | v not seen, limit $3 < \gamma$..... | ..... | <13.5 | good | ... | .... | .... |
| 107 | 4 | 9 | 5693.63 | 460 | 40 | v not seen, limit $1-2 < \pi$..... | ..... | <15.1 | poor | ... | .... | .... |
| 108 | Dec. 21 | 6 | 5740.50 | 350 | 40 | v not seen, limit π..... | ..... | <15 | fair | ... | .... | .... |
| 109 | 1902 Mar. 28 | 15 | 5837.88 | 237 | 40 | v not seen, limit $6 < \gamma$..... | ..... | <13.9 | moon | ... | .... | .... |
| 110 | Apr. 12 | 15 | 5852.88 | 237 | 40 | { v not seen, limit $4 < A$ or 2-3 < π } | ..... | <16.7 | good | ... | .... | .... |
| 111 | May 8 | 13 | 5878.79 | 460 | 40 | $\varphi 3v, \rho 2v, \mu 2v, \pi 1v$ | 1.5, 1.5, 0.0, 3.0..... | 1.5 | 15.20 | fair | 428 | -0.06 |
| 112 | 29 | 12 | 5899.75 | 237 | 40 | { $v 3-4\mu, \pi 1\mu, \gamma 8-10v \pm$ v is 1 μ . 36 < γ , photometer } | ..... | 5.5 | 14.66 | fair | 449 | +0.43 |
| 113 | July 3 | 10 | 5934.67 | 80 | 12 | v not seen, γ limit..... | ..... | <13 | .... | ... | .... | .... |
| 114 | Sept. 7 | 10 | 6000.67 | ... | 24 | photograph, plate..... | ..... | 10.4 | poor | 21 | +0.8± | .... |
| 115 | 26 | 11 | 6019.63 | 237 | 40 | { $v < x$ by 1.09=10.37..... $v < d$ by 0.91=10.21..... } | ..... | 10.29 | poor | 40 | +0.31 | .... |
| 116 | 1903 Apr. 3 | 15 | 6208.88 | 237 | 40 | $v 1-2\mu, v 1-2\pi \pm$ | 3.5, 5.5..... | 4.5 | 14.90 | poor | 229 | +0.34 |
| 117 | July 24 | 10 | 6320.67 | 237 | 40 | v not seen, limit $1\mu < \gamma$..... | ..... | <14 | poor | ... | .... | .... |
| 118 | Sept. 17 | 8 | 6375.58 | 80 | 6 | v not seen, limit $4 < a$..... | ..... | <12.6 | good | ... | .... | .... |
| 119 | Oct. 9 | ... | 6397 | ... | 12 | v not seen, limit γ..... | ..... | <13 | .... | ... | .... | .... |
| 120 | 25 | ... | 6413 | ... | 12 | v not seen, limit γ..... | ..... | <13 | .... | ... | .... | .... |
| 121 | 1904 July 31 | 12 | 6693.75 | 150 | 6 | v not seen, limit a..... | ..... | <12 | .... | ... | .... | .... |
| 122 | Aug. 3 | 9 | 6697.63 | 67 | 12 | v not seen, limit γ..... | ..... | <13 | .... | ... | .... | .... |
| 123 | 6 | 12 | 6700.75 | ... | 18 | $\varphi 4v, \mu 4v, v 3\rho, v 4\pi$ | 0.5, 2.0, 6.5, 8.0..... | 3.3 | 15.00 | good | 191 | +0.14 |
| 124 | 7 | 11 | 6700.71 | ... | 12 | photographs, Nos. 94, 95..... | ..... | <14 | good | ... | .... | .... |
| 125 | Oct. 8 | 11 | 6762.71 | 237 | 40 | $\varphi 4v$ or μ , v or $\mu 3\rho$..... | ..... | <15 | fair | ... | .... | .... |
| 126 | Nov. 30 | 7 | 6815.54 | 40 | 6 | v not seen, limit $1-2 < a$..... | ..... | <12.3 | good | ... | .... | .... |
| 127 | 1905 Jan. 3 | 7 | 6849.54 | 237 | 40 | $\varphi 1v$ or μ , v or $\mu 1\rho$..... | ..... | <15 | fair | ... | .... | .... |
| 128 | Mar. 12 | 17 | 6917.94 | 450 | 40 | v not seen, limit $2-3\omega$..... | ..... | <14.0 | poor | ... | .... | .... |
| 129 | Apr. 4 | 16 | 6940.92 | 750 750 | 40 40 | $\varphi 2v, v 2\rho, v 4\mu$ $\varphi 1v, v 3\rho, v 3\mu$ | 2.5, 5.5, 6.0..... 3.5, 6.5, 5.0..... | 4.7 5.0 | 14.86 | fair | 436 | -0.06 |
| 130 | 11 | 16 | 6947.92 | 750 | 40 | { $v 6\mu, v 4\rho, v 1\pi$ $\omega 8v$ } | 8.0, 8.5, 5.0..... 7.5..... | 7.2 | 14.59 | fair | 440 | -0.19 |
| 131 | 30 | 15 | 6966.88 | 237 | 40 | $\gamma 4v, v 5\rho, v 8\mu$ | 16.0, 9.5, 10.0..... | 11.8 | 14.16 | fair | 458 | +0.36 |
| 132 | May 22 | 14 | 6988.83 | 450 250 250 | 40 40 40 | $\gamma 3-4v, \omega 1v, v 6\omega'$ $\gamma 3v, v 1\omega$ $v 1-2\gamma, v 1-2\omega$ | 16.5, 14.0, 16.0..... 17.0, 18.0..... 21.5, 16.5..... | 16.5 | 13.57 | fair | 480 | +0.92 |
| 133 | June 4 | 14 | 7001.83 | 450 450 | 40 40 | $\gamma 1-2v, v 1-2\omega$ $\gamma 1-2v, v 1-2\omega$ | 18.5, 16.5..... 22.0, 23.1..... | 18.2 | 13.36 | fair | 493 | +1.35 |
| 134 | 13 | 14 | 7010.83 | 237 | 40 | $v 2\gamma, a 4-5v$ | 22.0, 23.1..... | 22.6 | 12.79 | fair | 502 | +1.34 |
| 135 | 26 | 11 | 7023.71 | 300 | 12 | $\omega 4v, v 4-5\gamma$ | 23.6, 24.5..... | 24.0 | 12.60 | good | 515 | +2.01 |
| 136 | July 23 | 10 | 7050.67 | 237 | 40 | $v 2f$..... | ..... | 36.5 | 10.83 | good | 13 | +1.13 |
| 137 | Aug. 9 | 9 | 7067.63 | 40 | 6 | $v 6-8g, k 1v, v 1m$ | 43.4, 39.2, 41.9..... | 40.9 | 10.15 | good | 30 | +0.26 |
| 138 | 11 | 10 | 7069.67 | ... | 12 | photographs, Nos. 211, 212..... | ..... | 10.35 | fair | 32 | .... | .... |
| 139 | 28 | 9 | 7086.63 | 40 | 6 | $k 1v, v 3m, v 5g$ | 39.2, 43.9, 41.4..... | 40.4 | 10.21 | good | 49 | 0.00 |
| 140 | Sept. 17 | 8 | 7106.56 | 150 | 6 | $m 8v, v 1g, v 4f$ | (32.9), 37.4, 38.5..... | 37.8 | 10.62 | dull | 69 | 0.00 |
| 141 | Oct. 1 | 10 | 7120.67 | 237 | 40 | $g 1v, v 1f$ | 35.4, 35.5..... | 35.4 | 10.98 | fair | 83 | +0.05 |
| 142 | 20 | 7 | 7139.54 | 80 | 12 | $f 2v, v 6, v 5a$ | 32.5, 30.9, 32.6..... | 31.9 | 11.50 | good | 102 | +0.10 |
| 143 | Dec. 30 | 6 | 7210.50 | 237 | 40 | $\gamma 4v, v 0-1\omega, v 3\sigma$ | 16.0, 17.0..... | 16.5 | 13.57 | good | 173 | +0.44 |

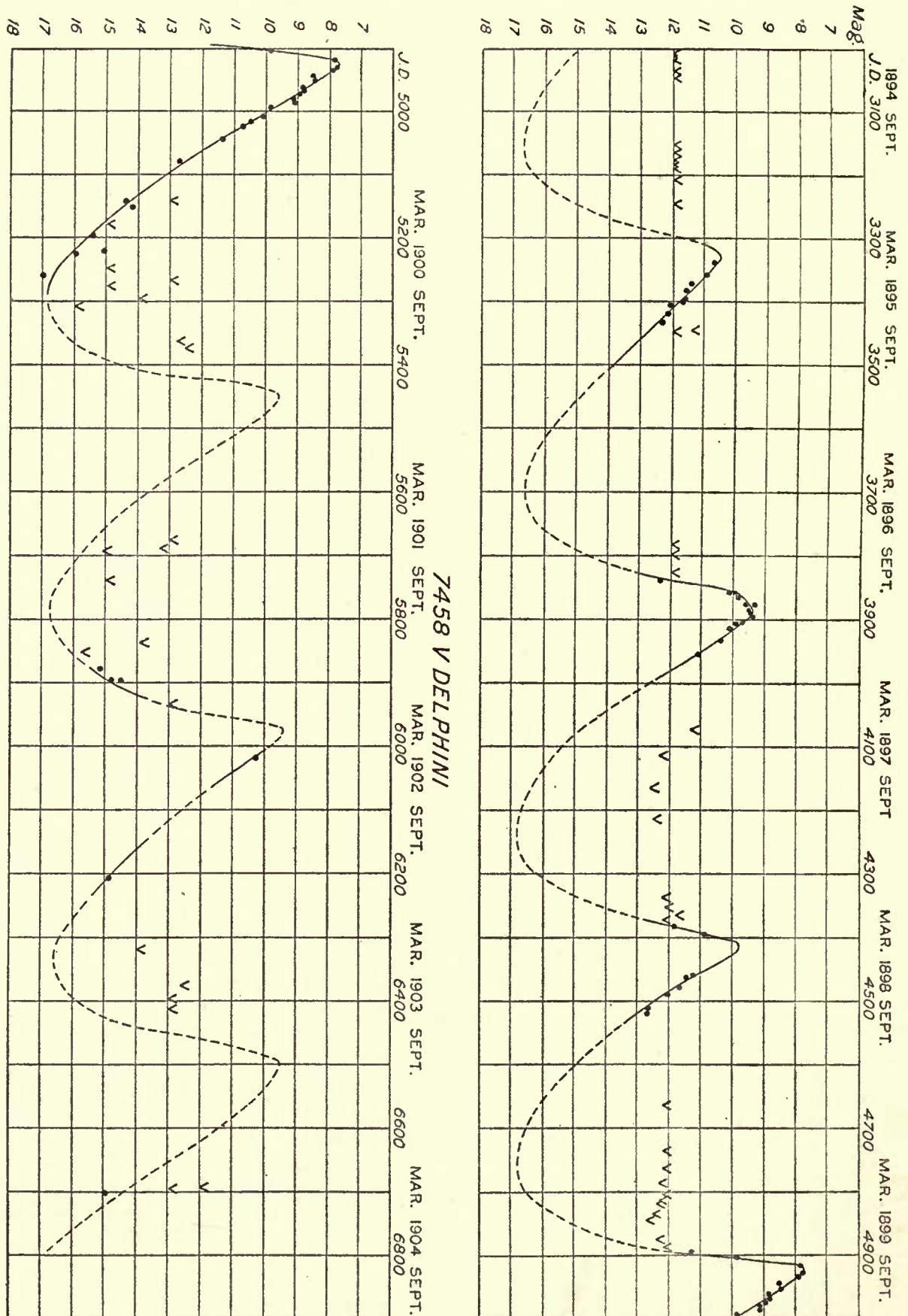


FIG. 32.—LIGHT-CURVE OF V DELPHINI.

TABLE 96.—7458 V DELPHINI. MEAN MAGNITUDES FROM 44½ DAY GROUPS.

| Group No..... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
|---------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| J. D..... | 44 | 88 | 132 | 176 | 220 | 265 | 309 | 353 | 397 | 441 | 485 | 529 | |
| 3334 { | <i>t</i> | 22 | 66 | 98 | .... | .... | .... | .... | .... | .... | .... | 517 | |
| | <i>M</i> | 10.98 | 11.81 | 12.35 | .... | .... | .... | .... | .... | .... | .... | 10.80 | |
| | ΔM | +1.19 | +1.23 | +1.06 | .... | .... | .... | .... | .... | .... | .... | +0.32 | |
| | No. | 3 | 5 | 2 | .... | .... | .... | .... | .... | .... | .... | 3 | |
| 3863 { | <i>t</i> | 24 | 60 | .... | .... | .... | .... | .... | .... | .... | .... | 518 | |
| | <i>M</i> | 9.60 | 10.24 | .... | .... | .... | .... | .... | .... | .... | .... | 11.83 | |
| | ΔM | -0.20 | -0.17 | .... | .... | .... | .... | .... | .... | .... | .... | +1.43 | |
| | No. | 8 | 2 | .... | .... | .... | .... | .... | .... | .... | .... | 1 | |
| 4392 { | <i>t</i> | 3 | 75 | 114 | .... | .... | .... | .... | .... | .... | .... | 514 | |
| | <i>M</i> | 10.83 | 11.46 | 12.46 | .... | .... | .... | .... | .... | .... | .... | 9.67 | |
| | ΔM | +0.95 | +0.71 | +0.75 | .... | .... | .... | .... | .... | .... | .... | -0.99 | |
| | No. | 1 | 3 | 3 | .... | .... | .... | .... | .... | .... | .... | 3 | |
| 4921 { | <i>t</i> | 24 | 64 | 107 | 160 | .... | 226 | 294 | 340 | .... | .... | .... |  |
| | <i>M</i> | 8.31 | 9.35 | 10.89 | 12.74 | .... | 14.3± | 15.49 | 17.0± | .... | .... | .... |  |
| | ΔM | -1.47 | -1.17 | -0.64 | -0.13 | .... | -0.2± | -0.44 | +0.4± | .... | .... | .... |  |
| | No. | 5 | 6 | 3 | 1 | .... | 2 | 3 | 1 | .... | .... | .... |  |
| 5450 { | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | .... | 428 | 449 | .... |  |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | .... | 15.20 | 14.66 | .... |  |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | -0.06 | +0.43 | .... |  |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | 1 | 1 | .... |  |
| 5979 { | <i>t</i> | 30 | .... | .... | .... | .... | 229 | .... | .... | .... | .... | .... |  |
| | <i>M</i> | 10.34 | .... | .... | .... | .... | 14.90 | .... | .... | .... | .... | .... |  |
| | ΔM | +0.56 | .... | .... | .... | .... | +0.34 | .... | .... | .... | .... | .... |  |
| | No. | 2 | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... |  |
| 6508 { | <i>t</i> | .... | .... | .... | .... | 191 | .... | .... | .... | 429 | .... | .... |  |
| | <i>M</i> | .... | .... | .... | .... | 15.0± | .... | .... | .... | 14.77 | .... | .... |  |
| | ΔM | .... | .... | .... | .... | +1.4± | .... | .... | .... | -0.39 | .... | .... |  |
| | No. | .... | .... | .... | .... | 1 | .... | .... | .... | 3 | .... | .... |  |
| 7037 { | <i>t</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |  |
| | <i>M</i> | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |  |
| | ΔM | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |  |
| | No. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |  |
| Means { | <i>t</i> | 23 | 66 | 107 | 160 | 191 | 227 | 294 | 340 | | 429 | 449 | 516 |
| | <i>M</i> | 9.62 | 10.63 | 11.85 | 12.74 | 15.0± | 14.50 | 15.49 | 17.0± | | 14.88 | 14.66 | 10.46 |
| | ΔM | -0.17 | +0.06 | +0.31 | -0.13 | +1.4± | -0.02 | -0.44 | +0.4± | | -0.31 | +0.43 | -0.08 |
| | No. | 19 | 16 | 8 | 1 | 1 | 3 | 3 | 1 | | 4 | 1 | 7 |

MAGNITUDE-CURVE.

Fig. 31 gives a graphic view of the relation between the visual and photometric magnitudes. From this curve are taken the magnitudes of the stars not measured photometrically, and also the magnitude of the variable. The deviation of the star *v* from the curve seems greater than is allowable; this is explained by the fact that its place in the light scale depends on but one comparison with the variable, and therefore the effect of an error is slight.

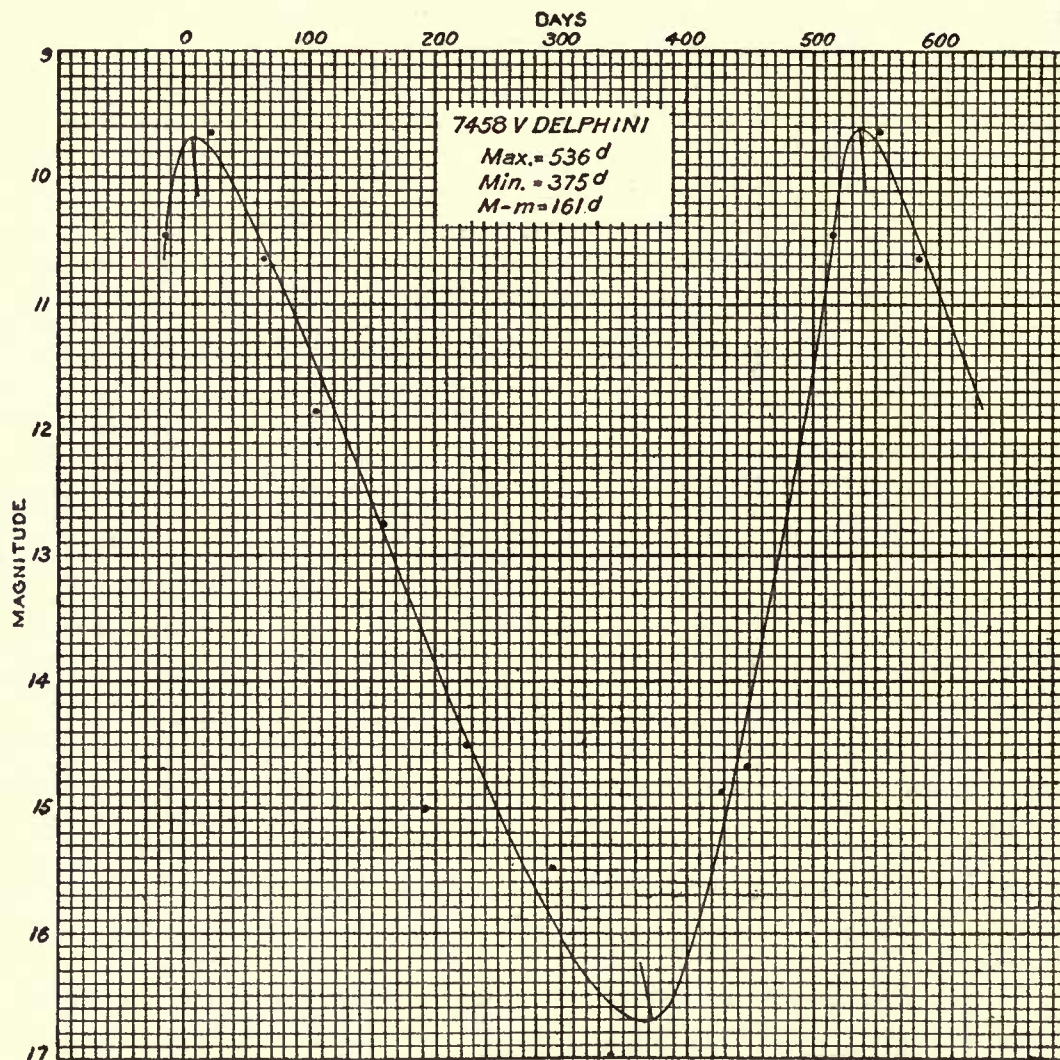


FIG. 33.—MEAN LIGHT-CURVE FOR V DELPHINI.

LIGHT-CURVE.

Fig. 32 shows the star's variations from June, 1894, to August, 1904, the parts of the curve determined by the observations being drawn full, the parts assumed, with a broken line. When the variable was invisible the limit of vision is indicated by the point of the V-shaped characters. It will be seen that the observations fix definitely the number of maxima possible during this interval, determine the time of maximum for epochs 4, 5, and 6, with considerable certainty, and of epochs 3 and 8 less definitely, and show that the magnitude at minimum is in the neighborhood of 17.

The striking characteristics of the star's variation are its great range, but little less than 10 magnitudes, and its rapid rise to maximum, best shown at epoch 6. The curve at maximum is usually quite sharp, though this is not confirmed by the observations of Reed at Harvard in 1891, published in *Astronomical Journal*, 13, 63. Further reference to these observations will be made later. The shape of the curve near minimum can be inferred by combining the observations on the descending branch of the curve following maximum 6 in 1900, and those on the ascending branch preceding maximum 8 in 1902. Combining these observations with the limit of vision when the star was not seen, the curve at minimum is fixed very nearly as drawn.

PERIOD OF VARIATION.

The elements of maximum given by Chandler in his Third Catalogue and retained in his "Revised Elements," published in 1904

$$1890 \text{ December } 20 (2411722) + 540^{\text{d}}\text{E.}$$

are based on six maxima between 1890 and 1899, fitting the first five maxima very well, but requiring a correction of -34 days for epoch 6, and about -80 days at epoch 9. The observations now available are represented better by the elements,

$$1891 \text{ January } 14 (2411747) + 529^{\text{d}}\text{E.}$$

This was obtained by using only the best observed maxima, 2, 4, and 6, and shortening the period thus obtained 2 days on account of the last maximum in the light-curve, No. 9.

In this connection two sets of observations require separate consideration. First, Mrs. Fleming's measures from the photographs, published in *Astronomische Nachrichten*, 127, 5, showing that the star was invisible, less than 10th magnitude, on six dates from June 30 to October 28, 1890, and photographically 9.3 magnitude, November 28; 8.6 on December 19; 9.0 December 20, and 8.7 on December 22. Considering the small number and range on these plates it is thought that no violence is done to them by assuming the date of maximum to be as late as January 14. Second, a set of observations made at Harvard by W. M. Reed, and published in *Astronomical Journal* 13, 63, are not in accord with the above elements and mean light-curve. They are given in Table 97, with the addition of three columns giving respectively the Julian day, the number of days after the preceding maximum as calculated by the foregoing elements, and the corresponding magnitude from the mean light-curve.

TABLE 97.

| Reed. | | J. D. | D. | Mag. from curve. |
|-------------|------|-------|------|------------------------|
| Date. | Mag. | | | |
| 1891 May 28 | 9.2 | 1881 | +134 | 12.6 |
| June 9 | 9.1 | 1893 | +146 | 12.9 |
| June 15 | 9.0 | 1899 | +152 | 13.0 |
| July 9 | 9.0 | 1923 | +176 | 13.5 |
| July 27 | 9.2 | 1941 | +194 | 13.9 |
| Aug. 20 | ... | .... | ... | .... |
| Sept. 2 | 9.4 | 1978 | +231 | 14.6 |
| 1892 Nov. 3 | 9.0 | 2406 | +130 | 12.6 |

If Chandler's elements are used the intervals after maxima will be still greater, so that a considerable change in period or form of curve must be assumed to explain the discrepancy, unless the star was misidentified.

NOTE.—The well observed maximum of epoch 10, completed since the above was written, gives a correction to the ephemeris of +34 days. Using the three best determined maxima, the period between epochs 4 and 6 is 524 days, between 6 and 10 it is 539 days, giving a mean period of 533 days, and indicating a secondary term in the elements, which will require further observations to definitely fix.

TABLE 98.—7458 V DELPHINI. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1891 Jan. 14 (J. D 2411747)+529^d E. $M - m = 161^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|-------|-------|-------|-----|---------|---------------|-------|------|------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 3 | 1895 May 15 | 3329 | 10.50 | 10.76 | -10 | 6 | 4 | 1896 May 30 | 3710 | .... | mc | + 3 | 1 |
| 4 | 1896 Nov. 16 | 3880 | 9.40 | 9.66 | +12 | 19 | 5 | 1897 Nov. 18 | 4247 | .... | mc | +11 | 1 |
| 5 | 1898 May 5 | 4415 | .... | mc | +18 | 10 | 7 | 1900 Sept. 27 | 5290 | 17.0 | 17.3 | - 4 | 8 |
| 6 | 1899 Oct. 1 | 4929 | .... | mc | + 3 | 24 | 8 | 1902 Feb. 26 | 5807 | .... | mc | -16 | 2 |
| 7 | 1901 Mar. 16 | 5455 | 7.80 | 8.08 | + 5 | 1 | 9 | 1903 Aug. 23 | 6350 | .... | mc | - 2 | 2 |
| 8 | 1902 Aug. 22 | 5984 | 10.0 | 10.3 | 0 | 4 | 10 | 1905 Jan. 4 | 6850 | .... | mc | -35 | 2 |
| 9 | 1904 Jan. 20 | 6500 | .... | mc | -13 | 1 | | | | | | | |
| 10 | 1905 Aug. 18 | 7076 | 10.10 | 10.36 | +34 | 20 | | | | | | | |

CHAPTER XII.

8518 Z CASSIOPEIÆ.

R. A. 23^h 39^m 39^s.9; Dec. + 56° 1' 33" (1900).

This variable was discovered by Anderson in 1898 and observations began in January, 1899. The field was measured with the micrometer on the 6-inch in January and February, 1899, but as the approximate place given for the star fell nearer to *r* than to the true place of the variable, that star was marked as the variable in the finding chart published by the writer in *Popular Astronomy*, 7, 94. The place of the variable given above was measured with the 6-inch from the stars *a* and *b*, which are given in the Helsingfors-Gotha A. G. catalogue. The stars *b*, *d*, *n*, and *x* were connected with the variable in January, 1900, with the 40-inch.

My experience with this field is a good illustration of the advantage of using several standard magnitude stars. The list selected included B. D. + 54° 3033, but after the photometer measures were completed it was found that the star had been misidentified, 3036 being measured instead. The measures were therefore reduced with the other two stars as standards, without much loss in accuracy.

A few of the faint comparison stars are so close to the variable that the scale used for the other charts would be too small; this chart is therefore reproduced on nearly double the usual scale.

TABLE 99.—8518 Z CASSIOPEIÆ. STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|--------|---------------|--------------|----------|-----------------|------------|--------|-----------|------|------------|----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H. C. O. | P. DM. | H. | P. | H. | P. | |
| A D | ° | <i>h m s</i> | ° ' " | WG G | | | | | | | |
| | +55 3010 | 23 39 56 | +55 14.7 | | 6.48 | 6.58 | 6.76 | 6.65 | +28 | +7 | ±4 |
| | +55 2990 | 23 32 26 | +55 19.4 | | 7.51 | 7.20 | 7.24 | 7.13 | -27 | -7 | ±5 |
| | Mean. . . . . | ..... | ..... | ..... | 7.00 | 6.89 | 7.00 | 6.89 | ±28 | ±7 | ±4 |

TABLE 100.—COMPARISON STARS IN B. D. CATALOGUE.

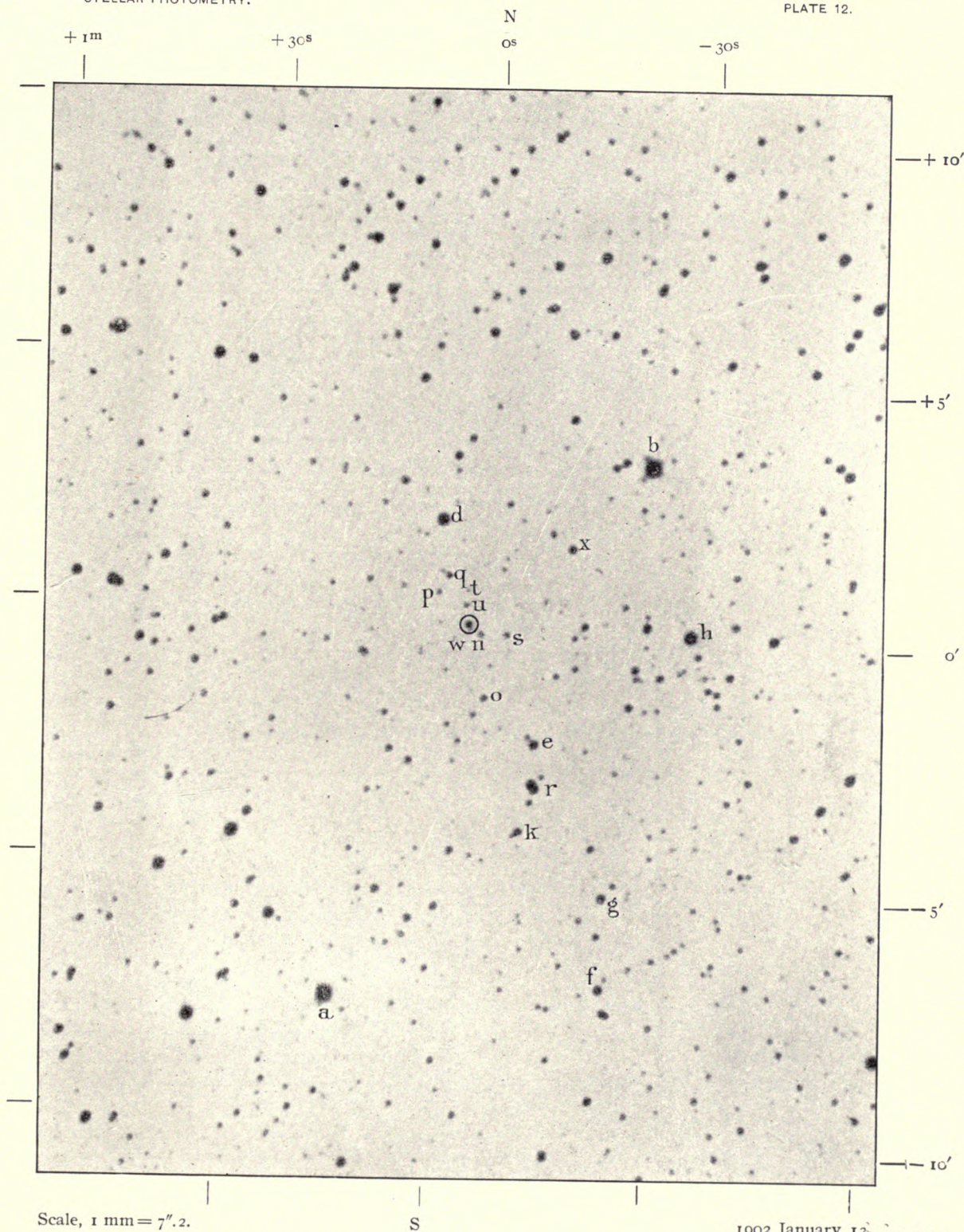
| Star. | B. D. | | 1855. | |
|----------|-----------|------|--------------|-----------|
| | No. | Mag. | R. A. | Dec. |
| | ° | | <i>h m s</i> | ° ' " |
| <i>b</i> | + 55 3007 | 9.2 | 23 37 5 | + 55 50.0 |
| <i>a</i> | + 55 3011 | 8.6 | 23 37 47 | + 55 39.9 |

TABLE 101.—COMPARISON STARS FOR Z CASSIOPELÆ (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|----------|----------------------------|-------|------|---------------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | | | | | H. | P. | H. | P. |
| | " | s | " | | | | | |
| <i>h</i> | -276 | -32.9 | + 3 | 37.0 | 10.75 | 10.64 | ..... | ..... |
| <i>b</i> | -208 | -24.8 | +200 | 44.1 | 9.79 | 9.68 | ..... | ..... |
| <i>f</i> | -188 | -22.4 | -420 | ..... | ..... | ..... | ..... | ..... |
| <i>g</i> | -182 | -21.7 | -311 | 27.5 | 11.97 | 11.86 | ..... | ..... |
| <i>x</i> | -117 | -13.9 | + 97 | 17.1 | 13.38 | 13.27 | ..... | ..... |
| <i>l</i> | - 92 | -11.0 | -188 | ..... | ..... | ..... | ..... | ..... |
| <i>r</i> | - 89 | -10.6 | -182 | 31.5 | ..... | ..... | 11.45 | 11.34 |
| <i>e</i> | - 88 | -10.5 | -137 | 23.1 | 12.25 | 12.14 | ..... | ..... |
| <i>k</i> | - 78 | - 9.3 | -239 | 21.6 | 12.99 | 12.88 | ..... | ..... |
| <i>s</i> | - 47 | - 5.6 | - 8 | 6.0 | ..... | ..... | 14.32 | 14.21 |
| <i>o</i> | - 23 | - 2.7 | - 83 | 9.9 | 13.96 | 13.85 | ..... | ..... |
| <i>n</i> | - 17 | - 2.0 | - 9 | 8.0 | 13.96 | 13.85 | ..... | ..... |
| <i>t</i> | + 3 | + 0.4 | + 40 | 1.0 | ..... | ..... | 14.88 | 14.77 |
| <i>u</i> | + 4 | + 0.5 | + 22 | 1.5 | ..... | ..... | 14.82 | 14.71 |
| <i>w</i> | + 17 | + 2.0 | - 17 | 0.0 | ..... | ..... | 15.00 | 14.89 |
| <i>q</i> | + 28 | + 3.3 | + 57 | 11.0 | 13.72 | 13.61 | ..... | ..... |
| <i>d</i> | + 40 | + 4.8 | +121 | 36.4 | 10.94 | 10.83 | ..... | ..... |
| <i>p</i> | + 40 | + 4.8 | + 37 | 10.0 | 13.64 | 13.53 | ..... | ..... |
| <i>a</i> | +139 | +16.6 | -448 | .... | 8.32 | 8.21 | ..... | ..... |

TABLE 102.—8518 Z CASSIOPELÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

| 1904 September 5. | | | 6-INCH. | | | Good, a little dull. | | |
|-------------------|------------|-----------------------|-----------------|----------------------|------------|----------------------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | ° | | | | | | | |
| 20 39 | 31 | <i>D_{at}</i> | 13.3 12.8 13.4 | 13.17 | 12.95 | 0.63 | 7.94 | 7.83 |
| | | <i>E</i> | 14.3 13.7 15.0 | 14.33 | 14.33 | 0.84 | 8.15 | 8.04 |
| | | <i>A_{at}</i> | 10.0 9.0 9.9 | 9.63 | 9.55 | 0.24 | 7.55 | 7.44 |
| | | <i>a</i> | 17.0 15.8 15.9 | 16.23 | 16.62 | 1.17 | 8.48 | 8.37 |
| | | <i>h</i> | 37.5 39.9 38.2 | 38.53 | 37.82 | 3.65 | 10.96 | 10.85 |
| | 30 | <i>b</i> | 24.5 25.1 25.0 | 24.87 | 25.22 | 2.15 | 9.46 | 9.35 |
| | | <i>d</i> | 39.5 39.9 39.8 | 39.73 | 39.78 | 3.82 | 11.13 | 11.02 |
| | | <i>d</i> | 40.0 39.7 39.8 | 39.83 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 24.9 25.9 25.9 | 25.57 | ..... | ..... | ..... | ..... |
| | | <i>h</i> | 37.1 37.3 36.9 | 37.10 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 17.2 17.0 16.8 | 17.00 | ..... | ..... | ..... | ..... |
| | | <i>A_{at}</i> | 9.2 9.3 9.9 | 9.47 | ..... | ..... | ..... | ..... |
| | | <i>E</i> | 14.3 14.8 13.9 | 14.33 | ..... | ..... | ..... | ..... |
| 20 59 | 28 | <i>D_{at}</i> | 12.2 12.9 13.1 | 12.73 | ..... | ..... | ..... | ..... |



Scale, 1 mm = 7''.2.

S

1902 January 13

8518 Z CASSIOPEIÆ.

R. A. 23^h 39^m 39^s.9. Dec. +56° 1' 33", 1900.

TABLE 102.—8518 Z CASSIOPEIÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 October 1. | | | 6-INCH. | | | | | | |
|------------------|------------|-----------------------|------------------|----------------------|------------|-------|------------|-------|--|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. | |
| <i>h m</i> | <i>°</i> | | | | | | | | |
| 22 32 | 17 | <i>E</i> | 14.7 15.3 14.7 | 14.90 | 14.24 | 0.82 | 8.07 | 7.96 | |
| | | <i>A_{at}</i> | 9.8 9.9 9.0 | 9.57 | 9.64 | 0.25 | 7.50 | 7.39 | |
| | | <i>D_{at}</i> | 14.0 13.3 13.7 | 13.67 | 13.79 | 0.76 | 8.01 | 7.90 | |
| | | <i>a</i> | 15.3 15.9 15.7 | 15.63 | 16.05 | 1.09 | 8.34 | 8.23 | |
| | | <i>d</i> | 38.2 38.3 38.1 | 38.20 | 38.60 | 3.71 | 10.96 | 10.85 | |
| | | <i>b</i> | 28.4 27.9 28.1 | 28.13 | 28.33 | 2.49 | 9.74 | 9.63 | |
| | | <i>h</i> | 37.9 38.2 38.6 | 38.23 | 38.45 | 3.70 | 10.95 | 10.84 | |
| | | <i>h</i> | 38.3 38.7 39.0 | 38.67 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 28.2 29.1 28.3 | 28.53 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 38.9 39.1 39.0 | 39.00 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 16.8 16.3 16.3 | 16.47 | ..... | ..... | ..... | ..... |  |
| | | <i>D_{at}</i> | 14.2 13.8 13.7 | 13.90 | ..... | ..... | ..... | ..... |  |
| | | <i>A_{at}</i> | 9.9 10.1 9.1 | 9.70 | ..... | ..... | ..... | ..... |  |
| | | <i>E_{at}</i> | 20.9 21.3 22.0 | 21.40 | ..... | ..... | ..... | ..... |  |
| 22 52 | 15 | <i>E</i> | 13.4 14.0 13.3 | 13.57 | ..... | ..... | ..... | ..... |  |
| 1904 October 5. | | | Floating clouds. | | | | | | |
| 21 20 | 27 | <i>A_{at}</i> | 8.2 8.2 7.5 | 7.97 | ..... | 0.12 | 7.55 | 7.44 | |
| | | <i>E_{at}</i> | 18.4 17.8 18.6 | 18.27 | ..... | 1.38 | 8.81 | 8.70 | |
| | | <i>D_{at}</i> | 12.2 12.3 12.0 | 12.17 | ..... | 0.52 | 7.95 | 7.84 | |
| | | <i>a</i> | 13.4 13.5 14.2 | 13.70 | 13.52 | 0.72 | 8.15 | 8.04 | |
| 21 37 | 25 | <i>d</i> | 38.3 38.9 38.2 | 38.47 | 38.10 | 3.67 | 11.10 | 10.99 | |
| | | <i>b</i> | 23.5 23.3 23.9 | 23.57 | 24.40 | 2.07 | 9.50 | 9.39 | |
| | | <i>h</i> | 36.1 36.0 35.6 | 35.90 | 36.12 | 3.42 | 10.85 | 10.74 | |
| | | <i>h</i> | 36.6 36.1 36.3 | 36.33 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 24.7 25.2 25.8 | 25.23 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 37.8 37.4 38.0 | 37.73 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 13.3 13.4 13.3 | 13.33 | ..... | ..... | ..... | ..... |  |
| 1904 October 27. | | | Fine. | | | | | | |
| 20 34 | 33 | <i>D_{at}</i> | 15.2 14.9 14.9 | 15.00 | 14.24 | 0.82 | 8.07 | 7.96 | |
| | | <i>E</i> | 13.0 13.1 13.0 | 13.03 | 13.05 | 0.65 | 7.90 | 7.79 | |
| | | <i>A_{at}</i> | 8.7 9.4 8.8 | 8.93 | 9.00 | 0.18 | 7.43 | 7.32 | |
| | | <i>a</i> | 14.7 14.9 15.1 | 14.90 | 14.92 | 0.93 | 8.18 | 8.07 | |
| | | <i>d</i> | 38.6 39.2 39.3 | 39.03 | 39.25 | 3.77 | 11.02 | 10.91 | |
| | | <i>b</i> | 24.3 25.2 24.9 | 24.80 | 26.07 | 2.25 | 9.50 | 9.39 | |
| | | <i>h</i> | 38.2 37.7 37.0 | 37.63 | 37.67 | 3.63 | 10.88 | 10.77 | |
| | | <i>h</i> | 37.7 37.6 37.8 | 37.70 | ..... | ..... | ..... | ..... |  |
| | | <i>b</i> | 27.7 27.1 27.2 | 27.33 | ..... | ..... | ..... | ..... |  |
| | | <i>d</i> | 39.5 39.7 39.2 | 39.47 | ..... | ..... | ..... | ..... |  |
| | | <i>a</i> | 15.1 14.6 15.1 | 14.93 | ..... | ..... | ..... | ..... |  |
| | | <i>A_{at}</i> | 9.2 9.0 9.0 | 9.07 | ..... | ..... | ..... | ..... |  |
| | | <i>E_{at}</i> | 20.0 19.3 19.7 | 19.67 | ..... | 1.55 | 8.80 | 8.69 | |
| | | <i>E</i> | 12.9 13.3 13.0 | 13.07 | ..... | ..... | ..... | ..... |  |
| | | <i>D_{at}</i> | 12.4 13.2 12.9 | 13.47 | ..... | ..... | ..... | ..... |  |
| 20 57 | 29 | <i>D_{at}</i> | 14.2 14.0 14.1 | ..... | ..... | ..... | ..... | ..... |  |

TABLE 102.—8518 Z CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 September 11. | | 12-INCH. | | | | Good. | | |
|---------------------|------------|------------------------------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 19 26 | ° 41 | <i>aa1</i> | 13.3 13.4 13.1 | 13.27 | 13.50 | 0.85 | 9.17 | 9.06 |
| | | <i>k</i> | 47.3 49.3 48.8 | 48.47 | 47.99 | 4.62 | 12.94 | 12.83 |
| | | <i>e</i> | 40.1 41.0 40.9 | 40.67 | 40.74 | 3.86 | 12.18 | 12.07 |
| | | <i>g</i> | 37.7 38.2 38.3 | 38.06 | 38.58 | 3.61 | 11.93 | 11.82 |
| | | <i>v</i> | 49.1 47.4 47.2 | 47.90 | 48.07 | 4.63 | 12.95 | 12.84 |
| | | <i>d</i> | 30.0 28.8 29.2 | 29.67 | 29.92 | 2.64 | 10.96 | 10.85 |
| | | <i>b</i> | 18.0 18.8 18.2 | 18.33 | 18.45 | 1.50 | 9.82 | 9.71 |
| | | <i>h</i> | 26.1 26.5 27.3 | 26.63 | 27.02 | 2.38 | 10.70 | 10.59 |
| | | <i>h</i> | 27.5 27.7 27.0 | 27.40 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 18.7 19.0 18.0 | 18.57 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 30.4 30.0 30.1 | 30.17 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 47.8 48.1 48.8 | 48.23 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 39.3 39.0 39.0 | 39.10 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 41.0 41.0 40.4 | 40.80 | ..... | ..... | ..... | ..... |
| | | <i>k</i> | 46.5 47.7 48.3 | 47.50 | ..... | ..... | ..... | ..... |
| 19 50 | 38 | <i>aa1</i> | 13.5 13.6 14.1 | 13.73 | ..... | ..... | ..... | ..... |
| 1904 November 2. | | Fair to good, quiet, dull. | | | | | | |
| 20 36 | 31 | <i>a</i> | 12.1 11.2 12.0 | 11.77 | 11.70 | 0.63 | 8.38 | 8.27 |
| | | <i>d</i> | 35.0 35.0 35.0 | 35.00 | 34.84 | 3.18 | 10.93 | 10.82 |
| | | <i>b</i> | 24.3 22.9 23.3 | 23.50 | 23.42 | 2.06 | 9.81 | 9.70 |
| | | <i>h</i> | 32.7 31.5 32.5 | 32.23 | 32.58 | 2.93 | 10.68 | 10.57 |
| | | <i>e</i> | 47.7 48.6 47.2 | 47.83 | 46.93 | 4.51 | 12.26 | 12.15 |
| | | <i>k</i> | 57.7 59.7 57.3 | 58.23 | 58.60 | 5.43 | 13.18 | 13.07 |
| | | <i>g</i> | 43.3 44.0 43.8 | 43.70 | 44.04 | 4.22 | 11.97 | 11.86 |
| | | <i>g</i> | 44.8 44.0 44.3 | 44.37 | ..... | ..... | ..... | ..... |
| | | <i>k</i> | 59.2 57.8 59.9 | 58.97 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 46.1 45.2 46.8 | 46.03 | ..... | ..... | ..... | ..... |
| | | <i>h</i> | 34.0 33.0 31.8 | 32.93 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 23.2 23.6 23.2 | 23.33 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 35.0 34.8 34.2 | 34.67 | ..... | ..... | ..... | ..... |
| 20 56 | 29 | <i>a</i> | 12.3 11.5 11.1 | 11.63 | ..... | ..... | ..... | ..... |
| 1904 November 3. | | Twilight at beginning, good. | | | | | | |
| 20 37 | 32 | <i>a</i> | 7.0 8.1 7.2 | 7.43 | 7.27 | 0.23 | 8.25 | 8.14 |
| | | <i>d</i> | 32.3 32.1 32.1 | 32.17 | 32.42 | 2.90 | 10.92 | 10.81 |
| | | <i>b</i> | 19.9 19.3 19.6 | 19.60 | 20.04 | 1.72 | 9.74 | 9.63 |
| | | <i>h</i> | 32.8 31.1 32.1 | 32.00 | 31.87 | 2.85 | 10.87 | 10.76 |
| | | <i>e</i> | 44.8 44.9 45.4 | 45.03 | 44.82 | 4.30 | 12.32 | 12.21 |
| | | <i>k</i> | 49.5 49.6 49.7 | 49.60 | 50.40 | 4.84 | 12.86 | 12.75 |
| | | <i>g</i> | 41.8 41.8 42.3 | 41.97 | 41.94 | 4.00 | 12.02 | 11.91 |
| | | <i>g</i> | 41.5 42.0 42.2 | 41.90 | ..... | ..... | ..... | ..... |
| | | <i>k</i> | 51.6 51.3 50.7 | 51.20 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 45.5 43.6 44.7 | 44.60 | ..... | ..... | ..... | ..... |
| | | <i>h</i> | 31.0 32.0 32.2 | 31.73 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 19.9 21.2 20.3 | 20.47 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 33.3 32.6 32.1 | 32.67 | ..... | ..... | ..... | ..... |
| | | <i>a</i> | 6.0 8.1 7.2 | 7.10 | ..... | ..... | ..... | ..... |
| 20 56 | 29 | <i>aa1</i> | 14.7 15.2 15.1 | 15.00 | ..... | ..... | ..... | ..... |

TABLE 102.—8518 Z CASSIOPEIÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1900 July 12. | | 40-INCH, WEDGE II. | | | | Moon. | | |
|------------------|------------|--------------------|---------------------|----------------------|------------|------------------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 21 | ° | <i>d</i> | 11.2 16.0 14.0 15.2 | 14.10 | ..... | 0.56 | 10.87 | 10.76 |
| | | <i>x</i> | 34.4 31.8 32.9 32.7 | 32.95 | 31.78 | 3.07 | 13.38 | 13.27 |
| | | <i>s</i> | 45.1 44.0 44.9 44.2 | 44.55 | ..... | 4.46 | 14.77 | 14.66 |
| | | <i>e</i> | 26.0 24.7 24.8 23.1 | 24.65 | ..... | 2.20 | 12.51 | 12.40 |
| | | <i>o</i> | 37.5 | 37.5 | ..... | 3.65 | 13.96 | 13.85 |
| | | <i>a</i> | 34.5 35.0 33.9 37.4 | 35.20 | ..... | 3.41 | 13.72 | 13.61 |
| | | <i>k</i> | 26.7 29.9 28.3 29.0 | 28.48 | ..... | 2.70 | 13.01 | 12.90 |
| | | <i>q</i> | 34.1 35.3 35.4 35.0 | 34.95 | ..... | 3.38 | 13.69 | 13.58 |
| | | <i>x</i> | 30.2 30.3 31.0 30.9 | 30.60 | ..... | ..... | ..... | ..... |
| | | <i>h</i> | 10.9 12.8 11.0 10.8 | 11.38 | ..... | 0.23 | 10.54 | 10.34 |
| 1900 October 24. | | WEDGE II. | | | | Seeing variable. | | |
| | | <i>b</i> | 15.0 17.1 15.7 | 15.93 | ..... | 0.83 | 9.37 | 9.26 |
| | | <i>d</i> | 28.2 27.7 28.7 | 28.20 | 27.39 | 2.56 | 11.10 | 10.99 |
| | | <i>q</i> | 54.5 53.3 53.5 | 53.77 | 52.27 | 5.13 | 13.67 | 13.56 |
| | | <i>p</i> | 55.0 53.1 55.0 | 54.37 | 52.75 | 5.18 | 13.72 | 13.61 |
| | | <i>v</i> | 53.0 55.3 51.2 | 53.17 | 51.62 | 5.10 | 13.64 | 13.53 |
| | | <i>n</i> | 58.3 58.1 57.2 | 57.87 | 56.74 | 5.50 | 14.04 | 13.93 |
| | | <i>e</i> | 35.8 37.7 37.9 | 37.13 | 36.77 | 3.57 | 12.11 | 12.00 |
| | | <i>k</i> | 44.2 44.9 43.6 | 44.23 | 44.05 | 4.40 | 12.94 | 12.83 |
| | | <i>g</i> | 37.2 37.8 37.8 | 37.60 | 37.22 | 3.62 | 12.16 | 12.05 |
| | | <i>g</i> | 37.8 36.7 36.0 | 36.83 | ..... | ..... | ..... | ..... |
| | | <i>k</i> | 43.5 43.8 44.3 | 43.87 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 35.0 37.0 37.2 | 36.40 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 54.2 55.9 56.7 | 55.60 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 50.0 49.0 51.2 | 50.07 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 50.2 52.1 51.1 | 51.13 | ..... | ..... | ..... | ..... |
| | | <i>q</i> | 49.9 52.4 50.0 | 50.77 | ..... | ..... | ..... | ..... |
| 2 15 | | <i>d</i> | 24.3 27.2 28.2 | 26.57 | ..... | ..... | ..... | ..... |
| 1905 January 3. | | WEDGE V. | | | | Good. | | |
| | | <i>g</i> | 24.3 24.8 25.9 | 25.00 | 23.10 | 2.04 | 12.06 | 11.95 |
| | | <i>k</i> | 31.9 33.0 31.6 | 32.17 | 31.04 | 2.77 | 12.79 | 12.68 |
| | | <i>e</i> | 26.0 27.8 27.3 | 27.03 | 26.55 | 2.33 | 12.35 | 12.24 |
| | | <i>n</i> | 41.7 41.7 41.5 | 41.63 | 41.00 | 3.89 | 13.91 | 13.80 |
| | | <i>v</i> | 55.7 56.4 57.4 | 56.50 | 56.38 | 5.31 | 15.33 | 15.22 |
| | | <i>p</i> | 38.7 37.9 37.3 | 37.97 | 38.05 | 3.56 | 13.58 | 13.47 |
| | | <i>q</i> | 39.4 39.3 40.6 | 39.77 | 39.65 | 3.74 | 13.76 | 13.65 |
| | | <i>q</i> | 39.5 40.0 39.1 | 39.53 | ..... | ..... | ..... | ..... |
| | | <i>p</i> | 38.1 38.3 38.0 | 38.13 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 54.2 56.8 57.8 | 56.27 | ..... | ..... | ..... | ..... |
| | | <i>n</i> | 41.2 39.1 40.8 | 40.37 | ..... | ..... | ..... | ..... |
| | | <i>e</i> | 27.0 25.5 25.7 | 26.07 | ..... | ..... | ..... | ..... |
| | | <i>k</i> | 30.0 29.9 29.8 | 29.90 | ..... | ..... | ..... | ..... |
| 3 0 | | <i>g</i> | 20.2 21.2 22.2 | 21.20 | ..... | ..... | ..... | ..... |

TABLE 103.—8518 Z CASSIOPELÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | |
|----------------------|-------------------|-----------|---------|---------------|----------------------|------------------|-----------|----------|---------------|-----------|
| Star. | 1904 September 5. | | | | | 1904 October 1. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. |
| A | -0.51 | 6.80 | 6.69 | + .32 | + .11 | -0.50 | 6.75 | 6.64 | + .27 | + .06 |
| D | -0.12 | 7.19 | 7.08 | - .32 | - .12 | 0.01 | 7.26 | 7.15 | - .25 | - .05 |
| Means ..... | ..... | 7.00 | 6.89 | \pm .32 | \pm .12 | -0.25 | 7.00 | 6.89 | \pm .26 | \pm .06 |
| M ₀ ..... | ..... | 7.31 | 7.20 | ..... | ..... | ..... | 7.25 | 7.14 | ..... | ..... |
| Star. | 1904 October 5. | | | | | 1904 October 27. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. |
| A | -0.63 | 6.80 | 6.69 | + .32 | + .11 | -0.57 | 6.68 | 6.57 | + .20 | - .01 |
| D | -0.23 | 7.20 | 7.09 | - .31 | - .11 | 0.07 | 7.32 | 7.21 | - .19 | + .01 |
| Means | -0.43 | 7.00 | 6.89 | \pm .32 | \pm .11 | -0.25 | 7.00 | 6.89 | \pm .20 | \pm .01 |
| M ₀ ..... | ..... | 7.43 | 7.32 | ..... | ..... | ..... | 7.25 | 7.14 | ..... | ..... |
| 12-INCH. | | | | | 40-INCH. | | | | | |
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | | |
| | | Sept. 11. | Nov. 2. | Nov. 3. | | | July 12. | Oct. 24. | Jan. 3. | Jan. 7. |
| a | 8.29 | 0.01 | 0.63 | 0.23 | d | 10.94 | 0.56 | ..... | ..... | ..... |
| b | 9.55 | 1.50 | 2.06 | 1.72 | e | 12.25 | 2.20 | 3.57 | 2.33 | 2.42 |
| d | 11.05 | 2.64 | 3.18 | 2.90 | h | 10.75 | 0.23 | ..... | ..... | ..... |
| h | 10.91 | 2.38 | 2.93 | 2.85 | k | 12.99 | 2.70 | 4.40 | 2.77 | 2.93 |
| | | | | | g | 11.97 | ..... | 3.62 | 2.04 | 2.19 |
| Mean C ... | ..... | 1.63 | 2.20 | 1.93 | Mean C .. | ..... | 1.42 | 3.86 | 2.38 | 2.51 |
| Mean Mag. | 9.95 | 9.95 | 9.95 | 9.95 | Mean Mag. | ..... | 11.73 | 12.40 | 12.40 | 12.40 |
| M ₀ ..... | ..... | 8.32 | 7.75 | 8.02 | M ₀ ..... | ..... | 10.31 | 8.54 | 10.02 | 9.89 |

TABLE 105.—8518 Z CASSIOPEÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|-----------------|---------------|---------------------|---------|-----------|---|------------------------|--------|-------|---------|-----|--------|
| | Month and Day | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1898 Nov. 11 | .. | 2410000+ 4605.6 | ... | 2 | photograph, <i>d3v</i> , <i>v1r</i> | 33.4, 32.5..... | 33.0 | 11.3± | .... | 0 | +0.6± |
| 2 | 1899 Jan. 4 | .. | 4659 | 80 | 6 | <i>v5m'</i> , <i>m'4g</i> , <i>m'6e</i>..... | ..... | 34.4 | 11.10 | fair | 54 | +0.08 |
| 3 | 9 | 7 | 4664.52 | 150 | 6 | <i>v3-4m'</i> , <i>m'6e</i>..... | ..... | 32.9 | 11.29 | .... | 59 | +0.21 |
| 4 | 14 | 7 | 4669.54 | 200 | 6 | <i>m'</i> is double, 11 and 12 <i>m</i> } | ..... | 32.4 | 11.32 | .... | 64 | +0.17 |
| 5 | 19 | 7 | 4674.54 | 40 | 6 | <i>v3m'</i> , <i>m'5g</i> , limit <i>k</i>..... | ..... | 31.9 | 11.40 | fair | 69 | +0.19 |
| 6 | 24 | 6 | 4679.50 | 150 | 6 | <i>v2-3m'</i> , <i>m'3g</i> , <i>g3e</i> , <i>e2-3k</i>..... | ..... | 31.4 | 11.45 | fair | 74 | +0.15 |
| 7 | Feb. 7 | 7 | 4693.52 | 200 | 6 | <i>g4e</i> , <i>e3k</i> , <i>m'v</i>..... | ..... | 29.4 | 11.68 | good | 88 | +0.19 |
| 8 | 18 | 7 | 4704.54 | 150 | 6 | <i>d5v</i> , <i>v5e</i> | 31.4, 28.1..... | 29.8 | 11.69 | good | 99 | +0.02 |
| 9 | 24 | 7 | 4710.54 | 150 | 6 | <i>v</i> not seen, limit 4 < <i>d</i>..... | ..... | <32 | <11.4 | .... | ... | ... |
| 10 | 28 | 7 | 4714.54 | 150 | 6 | <i>e1v</i> , <i>d1ov</i> | 22.1, 26.4..... | 24.0 | 12.31 | fair | 109 | +0.50 |
| 11 | Mar. 7 | 7 | 4721.54 | 80 | 6 | <i>v1e</i> , <i>g4v</i> , <i>d1ov</i> ±..... | 24.1, 23.5, 26.4..... | 24.3 | 12.27 | fair | 116 | +0.30 |
| 12 | 13 | 8 | 4727.56 | 150 | 6 | <i>g2v</i> , <i>ve</i> , limit <i>v</i> | 25.5, 23.1..... | 23.3 | 12.38 | good | 122 | +0.31 |
| 13 | 28 | 8 | 4742.56 | 150 | 6 | <i>g4v</i> , <i>ve</i> | 23.5, 23.1..... | 21.1 | 12.64 | fair | 137 | +0.37 |
| 14 | Apr. 4 | 16 | 4749.92 | ... | 6 | <i>e2-3v</i> , <i>vk</i> | 20.6, 21.6..... | 23± | 12.4± | poor | 144 | 0.0± |
| 15 | 16 | 16 | 4761.92 | 200 | 6 | <i>ev</i> ±, uncertain..... | ..... | <23 | <12.4 | .... | ... | ... |
| 16 | 21 | 16 | 4766.92 | 200 | 6 | <i>v</i> not seen, limit <i>e</i>..... | ..... | <21 | <12.6 | .... | ... | ... |
| 17 | May 10 | 16 | 4785.92 | ... | 6 | <i>v</i> not seen, limit 2 < <i>e</i>..... | ..... | <23 | <12.4 | .... | ... | ... |
| 18 | 21 | 15 | 4796.88 | 150 | 6 | <i>v</i> not seen, limit <i>e</i>..... | ..... | <23 | <12.4 | .... | ... | ... |
| 19 | 29 | 10 | 4804.67 | 150 | 6 | <i>v</i> not seen, limit <i>e</i>..... | ..... | <23 | <12.4 | .... | ... | ... |
| 20 | June 7 | 10 | 4813.67 | 150 | 6 | <i>v</i> not seen, limit <i>e</i>..... | ..... | <23 | <12.4 | .... | ... | ... |
| 21 | 10 | 14 | 4816.83 | 150 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 22 | July 5 | 11 | 4841.71 | 150 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 23 | 29 | 10 | 4865.67 | 150 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 24 | Aug. 10 | 9 | 4877.63 | 150 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 25 | 26 | 9 | 4893.61 | 150 | 6 | <i>v</i> not seen, limit 1 < <i>e</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 26 | Sept. 13 | 8 | 4911.58 | ... | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 27 | 25 | 7 | 4923.54 | ... | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 28 | Oct. 2 | 8 | 4930.58 | 200 | 6 | <i>v</i> not seen, limit 1 < <i>k</i>..... | ..... | <21 | <12.6 | .... | ... | ... |
| 29 | 7 | 7 | 4935.54 | 150 | 6 | <i>v</i> not seen, limit 1 < <i>e</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 30 | 21 | 8 | 4949.56 | 200 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 31 | 24 | 8 | 4952.56 | 200 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 32 | ... | ... | ... | ... | ... | ... | ... | ... | ... | .... | ... | ... |
| 33 | Nov. 4 | 7 | 4963.54 | 200 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.5 | .... | ... | ... |
| 34 | 20 | 7 | 4979.52 | 150 | 6 | <i>v</i> not seen, limit <i>e</i>..... | ..... | <23 | <12.4 | .... | ... | ... |
| 35 | 22 | 7 | 4981.54 | 200 | 6 | <i>v</i> not seen, limit 1 < <i>k</i>..... | ..... | <21 | <12.5 | .... | ... | ... |
| 36 | 26 | 7 | 4985.54 | 200 | 6 | <i>v</i> not seen, limit 1 < <i>k</i>..... | ..... | <21 | <12.5 | .... | ... | ... |
| 37 | Dec. 4 | 7 | 4993.54 | 150 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.4 | .... | ... | ... |
| 38 | 19 | 6 | 5008.50 | 150 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.4 | .... | ... | ... |
| 39 | 23 | 7 | 5012.54 | 200 | 6 | <i>v</i> not seen, limit <i>k</i>..... | ..... | <22 | <12.4 | .... | ... | ... |
| 40 | 1900 Jan. 1 | 7 | 5021.52 | 150 | 6 | <i>v</i> not seen, limit 1 < <i>k</i>..... | ..... | <21 | <12.5 | .... | ... | ... |
| 41 | 8 | 7 | 5028.54 | 350 | 40 | <i>v2-3n</i> , <i>v</i> is 2 <i>m</i> < <i>e</i>..... | ..... | 10.5 | 13.83 | moon | 423 | +0.03 |
| 42 | 20 | 9 | 5040.62 | 350 | 40 | <i>v2n</i> , <i>np</i> , <i>p1g</i> , <i>q6s</i> , <i>s8t</i> , <i>tu</i>..... | ..... | 10.0 | 13.90 | fair | 435 | -0.41 |
| 43 | Feb. 4 | 7 | 5055.54 | 350 | 40 | <i>x1-2v</i> , <i>v4-5n</i> , <i>v3p</i> , <i>p1g</i> , <i>q1n</i> | 15.6, 12.5, 13.0..... | 13.7 | 13.48 | fair | 450 | +0.58 |
| 44 | 10 | 7 | 5061.54 | 350 | 40 | <i>v3-4x</i> , <i>k4v</i> , <i>v8n</i> | 20.6, 17.6, 16.0..... | 18.0 | 13.0 | good | 456 | +0.3± |
| 45 | 22 | 9 | 5073.63 | 350 | 40 | <i>v6-8x</i> , <i>v3k</i> , <i>v1e</i> , <i>d1ov</i> | 24.1, 24.6, 24.1, 24.6 | 24.3 | 12.27 | good | 468 | +0.27 |
| 46 | 25 | 7 | 5076.54 | 80 | 12 | <i>d8v</i> , <i>r3v</i> , <i>v1g</i> , limit 1 < <i>x</i> | 26.6, 27.5, 28.5..... | 27.2 | 11.97 | good | 471 | +0.18 |
| 47 | 26 | 7 | 5077.54 | 150 | 6 | <i>g2v</i> ±, limit <i>v</i> | 25.5 | 25.5 | 12.1 | poor | 472 | +0.4± |
| 48 | Mar. 6 | 8 | 5085.58 | 150 | 6 | <i>d1v</i> , <i>v3r</i> | 33.6, 34.5..... | 34.0 | 11.15 | good | 480 | +0.03 |
| 49 | 13 | 8 | 5092.58 | 150 | 6 | <i>v3-4d</i> , <i>v4h</i> | 38.1, 41.0..... | 39.5 | 10.50 | fair | 487 | -0.37 |
| 50 | 19 | 7 | 5098.54 | 150 | 6 | <i>b3-4v</i> , <i>v5d</i> | 40.6, 39.6..... | 40.4 | 10.39 | good | 1 | -0.28 |
| 51 | 31 | 8 | 5110.56 | 40 | 6 | <i>b3v</i> , <i>v6d</i> | 41.1, 40.6..... | 42.1 | 10.19 | fair | 13 | -0.42 |
| 52 | Apr. 29 | 15 | 5139.88 | 40 | 6 | <i>b1-2v</i> , <i>v8d</i> | 42.6, 42.6..... | 40.0 | 10.44 | good | 42 | -0.45 |
| 53 | May 20 | 14 | 5160.83 | 150 | 6 | <i>b4v</i> , <i>v4h</i> | 40.1, 41.0..... | 38.9 | 10.60 | good | 63 | -0.53 |
| 54 | June 15 | 9 | 5186.63 | 150 | 6 | <i>b4v</i> , <i>v3-4h</i> , <i>v4d</i> | 40.1, 40.5, 38.6..... | 34.7 | 11.08 | poor | 89 | -0.42 |
| 55 | July 12 | 13 | 5213.79 | 237 | 40 | <i>b6v</i> ±, <i>v3d</i> , <i>v4h</i> | 38.1, 37.6, 41.0..... | 29.1 | 11.72 | good | 116 | -0.24 |
| | | | | | | <i>h2v</i> , <i>d1v</i> , <i>v4r</i> | 35.0, 33.6, 35.5..... | | | | | |
| | | | | | | <i>c4v</i> , <i>v6e</i> | 29.1, 29.1..... | | | | | |

TABLE 105.—8518 Z CASSIOPEIÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---------------------|---------|-----------|--|---|--------|-------|---------|------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| | 1900 | | 2410000+ | | | | | | | | | |
| 56 | Aug. 6 | 9 | 5238.63 | 150 | 6 | g3-4v, v limit..... | 24.0..... | 24.0 | 12.30 | fair | 141 | -0.07 |
| 57 | 14 | 8 | 5246.58 | 150 | 6 | g3v, ve, v2k..... | 24.5, 23.1, 23.6..... | 23.7 | 12.33 | good | 149 | -0.16 |
| 58 | 28 | 8 | 5260.58 | 200 | 6 | e4v, k1v, limit v..... | 19.1, 20.6..... | 19.8 | 12.80 | good | 163 | +0.05 |
| 59 | Sept. 6 | 11 | 5269.71 | 237 | 40 | e1v, v3x..... | 22.1, 20.1..... | 21.1 | 12.65 | fair | 172 | -0.25 |
| 60 | 13 | 12 | 5276.75 | 237 | 40 | e1v, v4x..... | 22.1, 21.1..... | 21.6 | 12.59 | moon | 179 | -0.42 |
| 61 | Oct. 4 | 8 | 5297.58 | 237 | 40 | x3v, v4q..... | 14.1, 15.0..... | 14.5 | 13.38 | fair | 200 | -0.07 |
| 62 | 16 | 9 | 5309.63 | 460 | 40 | k8v, v4n, v3p, v3q, x5-6v.. | {13.6, 12.0, 13.0..} {14.0, 11.6.....} | 12.8 | 13.59 | good | 212 | -0.12 |
| 63 | 24 | 12 | 5317.75 | 237 | 40 | photometer..... | ..... | .... | 13.64 | poor | 220 | -0.25 |
| | 1901 | | | | | | | | | | | |
| 64 | Feb. 9 | 9 | 5425.63 | 150 | 6 | v not seen, limit e..... | ..... | <23 | <12.4 | fair | .... | .... |
| 65 | Dec. 21 | 8 | 5740.58 | 350 | 40 | ve, v2k, v4-5 x..... | 23.1, 23.6, 21.6..... | 22.7 | 12.46 | moon | 151 | -0.06 |
| | 1902 | | | | | | | | | | | |
| 66 | Jan. 13 | .. | 5763.6 | .. | 24 | k5v, x3v, v 5-6 o..... | 16.6, 14.1, 18.7..... | 16.5 | 13.15 | .... | 174 | +0.21 |
| 67 | Oct. 1 | 9 | 6024.63 | 237 | 40 | g2v, v1-2e..... | 25.5, 24.6..... | 25.0 | 12.20 | poor | 435 | -1.25± |
| 68 | 31 | 10 | 6054.67 | 237 | 40 | v3g, v6e±..... | 30.5, 29.1..... | 30.0 | 11.62 | fair | 465 | -0.48 |
| 69 | Nov. 7 | 15 | 6061.88 | 237 | 40 | photometer..... | ..... | .... | 11.49 | fair | 472 | -0.21 |
| | 1903 | | | | | | | | | | | |
| 70 | Oct. 10 | .. | 6398 | 67 | 12 | v not seen, limit 2 < k..... | ..... | <20 | <12.8 | .... | .... | .... |
| | 1904 | | | | | | | | | | | |
| 71 | Aug. 4 | 9 | 6697.63 | 150 | 6 | g3v, v2e..... | 24.5, 25.1..... | 24.8 | 12.22 | fair | 124 | +0.13 |
| 72 | 29 | 8 | 6722.56 | 150 | 6 | g4v, e1v, v2k..... | 23.5, 22.1, 23.6..... | 23.1 | 12.40 | good | 149 | -0.10 |
| 73 | Sept. 5 | .. | 6729 | 40 | 6 | {photometer, v not seen, limit e.....} | ..... | <23 | <12.4 | good | .... | .... |
| 74 | 11 | 8 | 6735.58 | 67 | 12 | photometer..... | ..... | .... | 12.95 | good | 162 | +0.23 |
| 75 | Oct. 1 | 10 | 6755.67 | 40 | 6 | {photometer, v not seen, limit e.....} | ..... | <23 | <12.4 | good | .... | .... |
| 76 | 8 | 11 | 6762.71 | 237 | 40 | x6-8v, k8v, v8p, v6q..... | 10.1, 13.6, 18.0, 16.0 | 14.4 | 13.38 | good | 189 | +0.18 |
| 77 | 27 | .. | 6781 | .. | 6 | v not seen, limit k..... | ..... | <21 | <12.6 | fine | .... | .... |
| 78 | 30 | .. | 6784 | .. | 24 | photographs..... | ..... | .... | 13.6 | .... | 211 | .... |
| 79 | Nov. 2 | .. | 6787 | .. | 12 | v not seen, limit 2 < k..... | ..... | <19 | <12.9 | fair | .... | .... |
| 80 | 6 | .. | 6791 | 237 | 40 | no-1v, v3-4s..... | 7.5, 9.5..... | 8.5 | 14.05 | fair | 218 | +0.20 |
| 81 | 14 | .. | 6799 | .. | 24 | photographs, vn..... | ..... | 8 | 14.1 | .... | 226 | +0.09 |
| | 1905 | | | | | | | | | | | |
| 82 | Jan. 3 | 8 | 6849.56 | 237 | 40 | m8v, p6v, u not seen..... | 0.0, 4.0..... | 2.0 | 14.78 | fair | 276 | -0.06 |
| 83 | 3 | 8 | 6849.56 | 237 | 40 | photometer..... | ..... | .... | 15.33 | good | | |
| 84 | 24 | 7 | 6870.54 | 237 | 40 | n6-8s, nq, n2p, x6n..... | ..... | <6 | <14.3 | fair | .... | .... |
| 85 | 28 | 7 | 6874.54 | 237 | 40 | o3n, nq, n1p, n3-4s..... | ..... | <6 | <14.3 | good | .... | .... |
| 86 | Feb. 9 | 8 | 6886.56 | 275 | 12 | {n glimpsed ? x3n±, limit 4-5 < k.....} | ..... | <6 | <14.3 | fair | .... | .... |
| 87 | 25 | 7 | 6902.52 | 237 | 40 | x10-12n, o1n, qn, n1p..... | ..... | <6 | <14.3 | good | .... | .... |
| 88 | Apr. 4 | 16 | 6940.92 | 237 | 40 | x8n±, n20, n6s..... | ..... | <6 | <14.3 | good | .... | .... |
| 89 | 11 | 16 | 6947.92 | 237 | 40 | q2n, p1n, no, n4s..... | ..... | <6 | <14.3 | fair | .... | .... |
| 90 | 30 | 15 | 6966.88 | 237 | 40 | n5v, sv, v1u..... | 3.0, 6.0, 2.5..... | 4.0 | 14.64 | fair | 393 | 0.00 |
| 91 | May 22 | 14 | 6988.83 | 450 | 40 | v3n, v1q, v2p, v10..... | 11.0, 12.0, 12.0, 10.9 | 11.5 | 13.70 | fair | 415 | -0.40 |
| 92 | June 4 | 14 | 7001.83 | 450 | 40 | v2-3q, v2-3n, v40, x6v..... | 13.5, 10.5, 13.9, 11.1 | 12.2 | 13.63 | fair | 428 | -0.02 |
| 93 | 13 | 14 | 7010.83 | 237 | 40 | v4q, v5n, x3v..... | 15.0, 13.0, 14.1..... | 14.0 | 13.43 | good | 437 | 0.00 |
| 94 | 27 | 14 | 7024.84 | 237 | 40 | photometer..... | ..... | .... | 13.35 | good | 451 | +0.55 |
| 95 | July 23 | 11 | 7050.71 | 237 | 40 | v40, v3q, x6v..... | 13.9, 14.0, 11.1..... | 13.4 | 13.50 | fair | 477 | +2.10 |
| 96 | 30 | 12 | 7057.75 | 237 | 40 | x3v, v4q..... | 14.1, 15.0..... | 14.5 | 13.38 | good | 484 | +2.42 |
| 97 | Aug. 6 | 9 | 7064.63 | 237 | 40 | x3-4v, v5q, v50..... | 13.6, 16.0, 14.9..... | 14.8 | 13.35 | good | 491 | +2.65 |
| 98 | 19 | 9 | 7077.63 | 237 | 40 | v7-8x, v4-5e, vg, h8-10v.. | 24.6, 27.6, 27.5, 28.0 | 27.3 | 11.95 | good | 12 | +1.34 |
| 99 | 22 | 11 | 7080.71 | 237 | 40 | v10-12x, v5e, v2g, h8v..... | 28±, 28.1, 29.5, 29± | 28.8 | 11.78 | good | 15 | +1.15 |
| 100 | 28 | 9 | 7086.63 | 150 | 6 | h1v, d2v, v8g±..... | 36.0, 34.4, 35..... | 35.2 | 11.00 | fair | 21 | +0.32 |
| 101 | Sept. 17 | 8 | 7106.58 | 150 | 6 | b6v, v6h, v6d..... | 38.1, 42.0, 42.4..... | 40.8 | 10.31 | fair | 41 | -0.55 |
| 102 | Oct. 20 | 8 | 7139.56 | 80 | 12 | v5d, v6h, b6v..... | 38.1, 43.0, 38.1..... | 39.3 | 10.51 | good | 74 | -0.77 |
| 103 | Nov. 21 | 6 | 7171.50 | 150 | 6 | d1v, h1v..... | 32.1, 36.0..... | 34.0 | 11.12 | good | 106 | -0.65 |

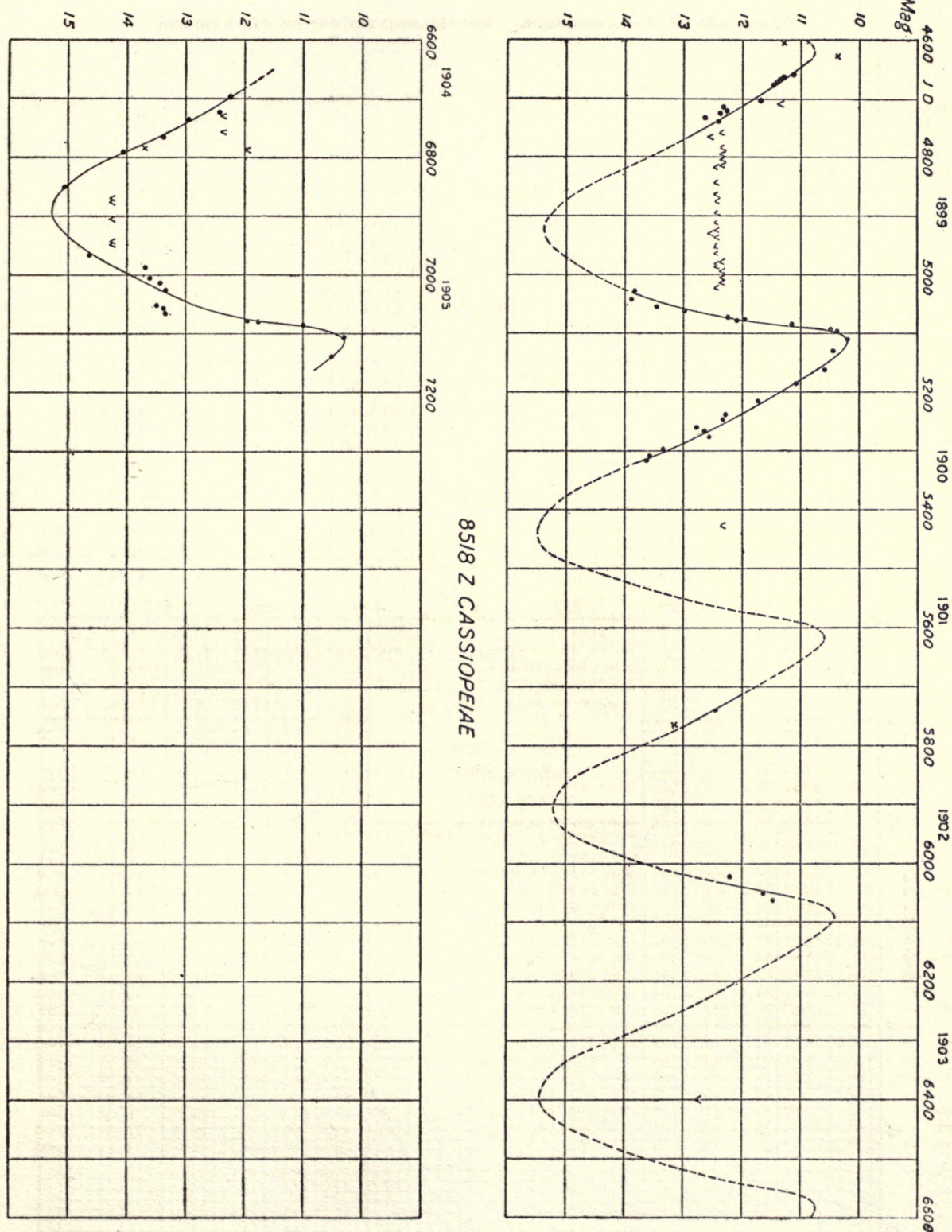


FIG. 35.—LIGHT-CURVE OF Z CASSIOPEÆ.

TABLE 106.—8518 Z CASSIOPEIAE. MEAN MAGNITUDES FROM 41 DAY GROUPS.

| Group No... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-------------|------------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|
| J. D..... | 41 | 82 | 123 | 164 | 205 | 246 | 287 | 328 | 369 | 410 | 451 | 492 |
| 4605 { | <i>t</i> | 0 | 64 | 107 | 140 | .... | .... | .... | .... | .... | 436 | 472 |
| | <i>M</i> | 11.3± | 11.31 | 12.07 | 12.52 | .... | .... | .... | .... | .... | 13.74 | 11.83 |
| | ΔM | +0.6± | +0.16 | +0.26 | +0.2± | .... | .... | .... | .... | .... | +0.34 | +0.14 |
| | No. | 1 | 5 | 5 | 2 | .... | .... | .... | .... | .... | 3 | 6 |
| 5097 { | <i>t</i> | 7 | 52 | 102 | 151 | 184 | 216 | .... | .... | .... | .... | .... |
| | <i>M</i> | 10.29 | 10.52 | 11.40 | 12.48 | 12.87 | 13.62 | .... | .... | .... | .... | .... |
| | ΔM | -0.35 | -0.49 | -0.33 | -0.06 | -0.25 | -0.18 | .... | .... | .... | .... | .... |
| | No. | 2 | 2 | 2 | 3 | 3 | 2 | .... | .... | .... | .... | .... |
| 5589 { | <i>t</i> | .... | .... | .... | 151 | 174 | .... | .... | .... | .... | 435 | 468 |
| | <i>M</i> | .... | .... | .... | 12.46 | 13.15 | .... | .... | .... | .... | 12.20 | 11.56 |
| | ΔM | .... | .... | .... | -0.06 | +0.21 | .... | .... | .... | .... | -1.25 | -0.34 |
| | No. | .... | .... | .... | 1 | 1 | .... | .... | .... | .... | 1 | 2 |
| 6573 { | <i>t</i> | .... | .... | .... | 145 | 189 | 218 | 276 | .... | .... | 393 | 433 |
| | <i>M</i> | .... | .... | .... | 12.52 | 13.38 | 13.95 | 15.06 | .... | .... | 14.64 | 13.53 |
| | ΔM | .... | .... | .... | +0.09 | +0.18 | +0.10 | +0.06 | .... | .... | 0.00 | +0.04 |
| | No. | .... | .... | .... | 3 | 1 | 3 | 1 | .... | .... | 1 | 4 |
| Means { | <i>t</i> | 5 | 61 | 106 | 147 | 185 | 217 | 276 | .... | .... | 393 | 436 |
| | <i>M</i> | 10.63 | 11.08 | 11.88 | 12.50 | 13.03 | 13.82 | 15.06 | .... | .... | 14.64 | 13.44 |
| | ΔM | -0.03 | -0.02 | +0.09 | +0.05 | -0.05 | -0.01 | +0.06 | .... | .... | 0.00 | -0.01 |
| | No. | 3 | 7 | 7 | 9 | 5 | 5 | 1 | .... | .... | 1 | 8 |

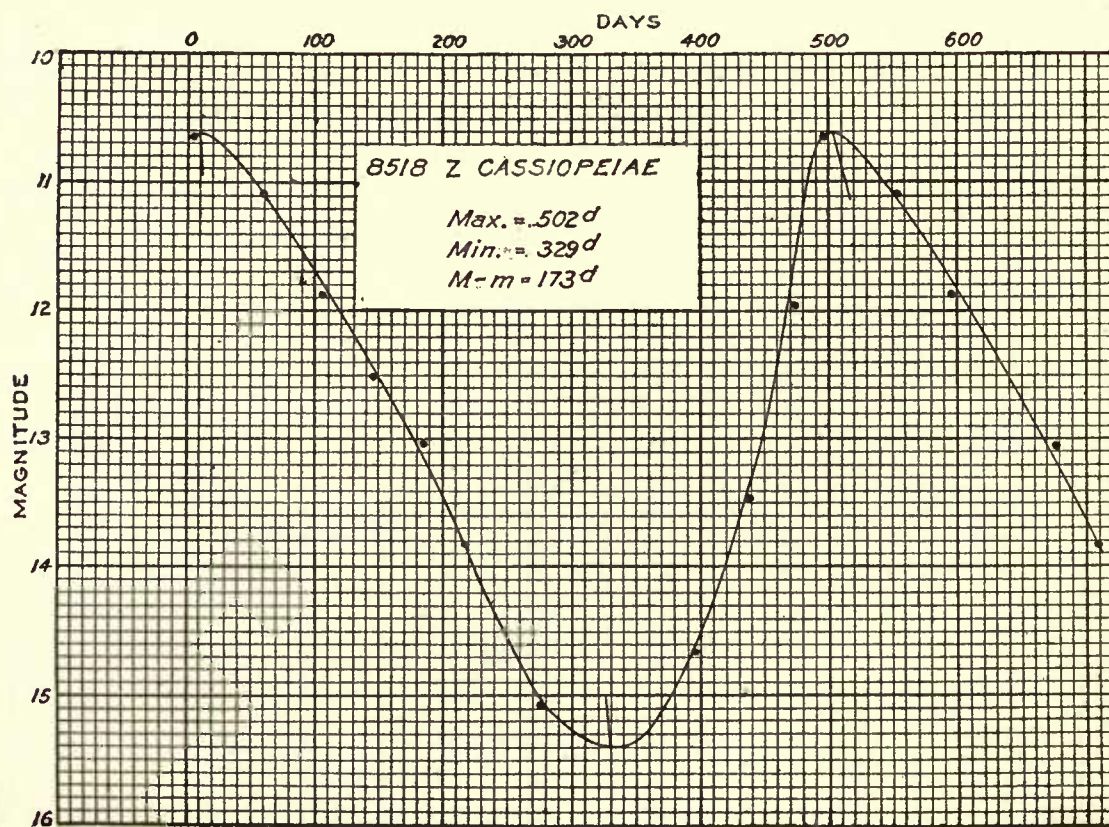


FIG. 36.—MEAN LIGHT-CURVE OF Z CASSIOPEIAE.

TABLE 107.—8518 Z CASSIOPEÆ. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1898 Nov. 22 (J. D. 2414617) + 492^d E. $M - m = 173^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|-------|-------|-------|-----|---------|--------------|-------|-------|-------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 0 | 1903 Nov. 27 | 4622 | 10.7 | 10.6 | + 5 | 9 | 1 | 1899 Oct. 9 | 4937 | mc | ..... | + 1 | 2 |
| 1 | 1900 Apr. 3 | 5113 | 10.20 | 10.09 | + 4 | 35 | 2 | 1901 Feb. 24 | 5440 | mc | ..... | - 12 | 2 |
| 2 | 1901 Aug. 18 | 5615 | mc | ..... | + 14 | 1 | 3 | 1902 June 2 | 5903 | mc | ..... | - 17 | 6 |
| 4 | 1904 Apr. 11 | 6582 | mc | ..... | - 3 | 4 | 5 | 1905 Feb. 11 | 6888 | 15.18 | 15.07 | - 16 | 15 |

The mean light-curve was formed from the observations up to 1905 June 27, and gives the mean period 492 days. The last minimum, 1905 February 16, is the only one well covered by the observations. The five comparisons between 1905 January 24 and April 11 were made with difficulty, owing to the low position of the field and the faintness of the variable, which seems to have been fainter than the star n . On account of the difficulties mentioned, the stars n and s were taken for the variable and n , but the real brightness of the variable is shown by the observations of January 3 and April 30. The comparisons made in May, June, and July show an unmistakable halt in the rise between the 13th and 14th magnitude, followed by a sudden increase of more than one magnitude between August 6 and 19. The corresponding rise in February, 1900, was less rapid.

The period 492 days satisfies the present series of observations, and there seem to be no others for comparison until Hartwig's are published.

CHAPTER XIII.

8629 Y CASSIOPEIÆ.

R. A. 23^h 58^m 13^s.8; Dec. +55° 7' 25" (1900).

This variable was discovered by Mrs. Fleming in 1898 at Harvard, from the bright hydrogen lines in its third type spectrum. H. C. O. Circular, No. 24, states that there are 101 plates containing the field, so when these are measured the variation of the star will be thoroughly known. The brighter stars in the field were measured with the 6-inch in February and March, 1898, and the place of the variable relative to the stars *A* and *B* (Cambridge A. G. catalogue) found as given above. The stars *b*, *e*, and *f* were connected with the variable with the micrometer on the 40-inch in February, 1900. The star *e* was found to be double, about 13th and 14th magnitude, position angle 198°, distance 6".6.

Visual comparisons of the variable began in February, 1898, a little too late to definitely fix the maximum, which the mean light-curve aids in placing at March 11, 9.4 magnitude on the Harvard scale. The decline following this maximum was followed with the 6- and 12-inch telescopes, and at the minimum the star remained below the limit of the 6-inch for 91 days, from 1898 September 7 to December 7. The next maximum, 1899 April 8, was well covered with the 6-inch, and the variable was found at minimum with the 40-inch, 1900 January 8 (minimum by mean curve, 1899 December 13). The adopted magnitude at the next maximum would be 9.6 or 10.6, according to the weights given to the discordant observations of June 15 and July 12. The probable course of the variations from October, 1900, to August, 1904, is shown by the broken line in fig. 38, fixed by the aid of the mean light-curve, guided by occasional observations sufficient to give the number of the epoch. From August, 1904, regular comparisons fix the maximum of epoch 6 and the following minimum, and show that the adopted period, 410 days, is substantially correct.

TABLE 108.—8629 Y CASSIOPEIÆ. STANDARD MAGNITUDE STARS.

| Star. | B. D. No. | 1900. | | Color P. DM. | Magnitude. | | | | Residuals. | | |
|-------|----------------|--------------|------------|-----------------|------------|--------|-----------|------|------------|-----|-----------------------------|
| | | R. A. | Dec. | | Catalogue. | | Measured. | | From Cats. | | 3 Nights inter se. |
| | | | | | H.C.O. | P. DM. | H. | P. | H. | P. | |
| C | ° | <i>h m s</i> | <i>° '</i> | | | | | | | | |
| F' | +54 3109 | 00 00 30 | +55 09.2 | G— | 7.11 | 7.05 | 7.29 | 7.02 | +18 | — 3 | ±4 |
| G | +55 3055 | 23 51 53 | +55 17.0 | WG | 7.01 | 6.57 | 6.88 | 6.61 | —13 | + 4 | ±6 |
| | +55 3041 | 23 49 02 | +55 56.0 | G | 7.48 | 7.16 | 7.43 | 7.16 | — 5 | 0 | ±6 |
| | Mean . . . . . | ..... | ..... | ..... | 7.20 | 6.93 | 7.20 | 6.93 | ±12 | ± 2 | ±5 |

MAGNITUDES OF COMPARISON STARS.

The standard magnitude stars in the two fields in the constellation Cassiopeiæ are distinguished from those in the other ten fields in that they are fainter in the Harvard than in the Potsdam Catalogue. The difference is only -0.11 in the Z Cassiopeiæ field, where it might be partially accounted for by the use of only two stars. But in this field, for three stars, the difference amounts to -0.27 . That this is not accidental, nor entirely due to the star colors, is shown by the standards in two "Rumford" fields, U and S Cassiopeiæ, where the differences are -0.16 and -0.01 , respectively, so that the mean difference for the four fields in this constellation is -0.14 , as compared with $+0.29$ for the other ten fields here considered. If the Harvard scale is adopted for this field the limit of vision of the 6-inch becomes 13.53 from the star α , an abnormally faint limit.

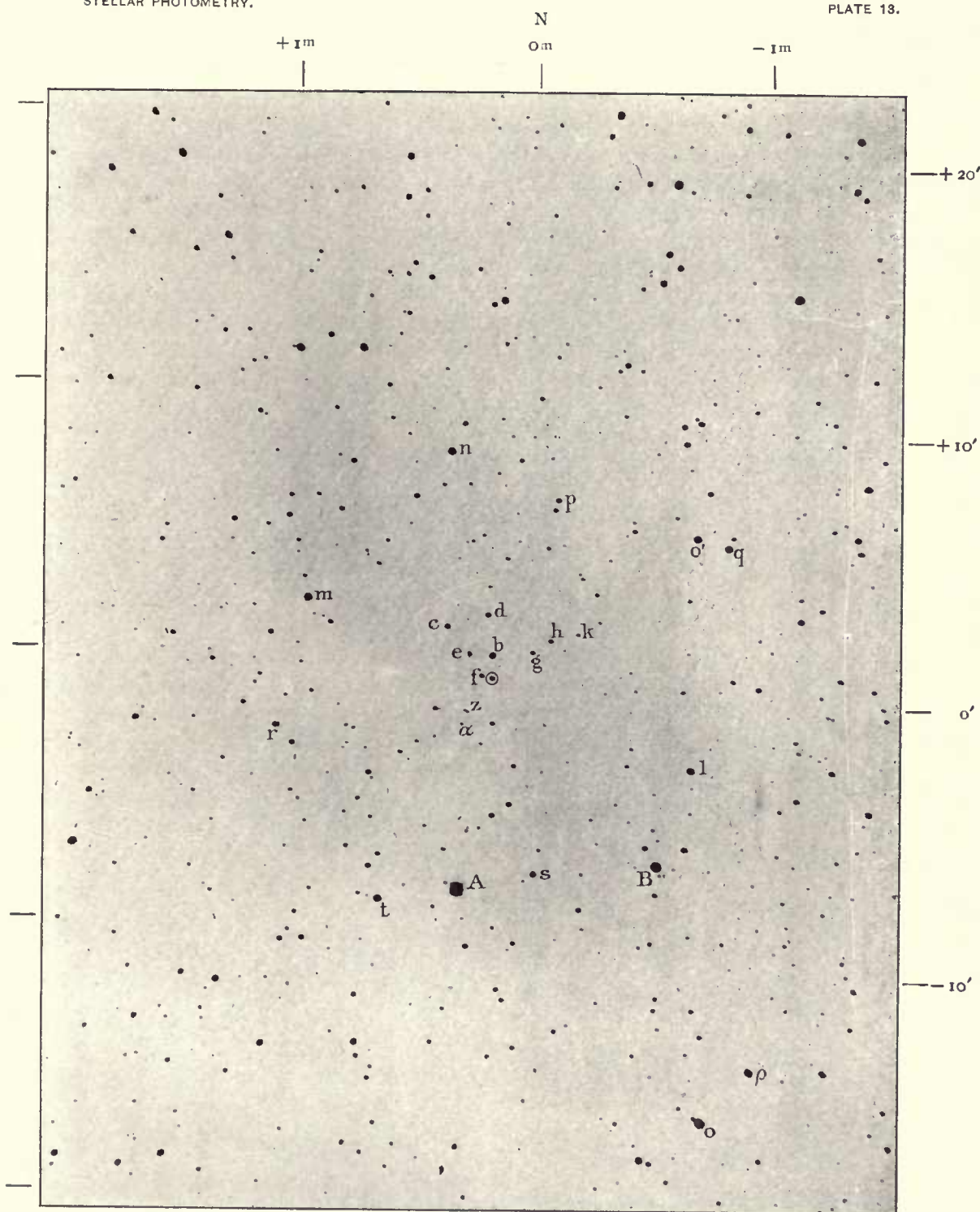
TABLE 109.—8629 Y CASSIOPEIÆ. COMPARISON STARS IN B. D. CATALOGUE.

| Star. | B. D. | | 1855. | | Star. | B. D. | | 1855. | |
|----------|----------|------|--------------|----------|----------|----------|------|--------------|----------|
| | No. | Mag. | R. A. | Dec. | | No. | Mag. | R. A. | Dec. |
| | ° | | <i>h m s</i> | ° ' | | ° | | <i>h m s</i> | ° ' |
| <i>p</i> | +54 3096 | 9.5 | 23 54 45 | +54 38.5 | <i>s</i> | +54 3102 | 9.5 | 23 55 42 | +54 45.6 |
| <i>o</i> | +54 3098 | 9.1 | 23 54 55 | +54 36.7 | <i>A</i> | +54 3103 | 7.9 | 23 56 2 | +54 44.9 |
| <i>l</i> | +54 3099 | 9.5 | 23 55 3 | +54 48.8 | <i>m</i> | +54 3105 | 9.5 | 23 56 42 | +54 54.0 |
| <i>B</i> | +54 3101 | 8.3 | 23 55 13 | +54 46.9 | <i>β</i> | +55 3078 | 9.1 | 23 56 40 | +55 13.3 |

TABLE 110.—COMPARISON STARS FOR Y CASSIOPEIÆ (IN ORDER OF RIGHT ASCENSION).

| Star. | Coordinates from Variable. | | | Light Scale, Steps. | Magnitude. | | | |
|-----------|----------------------------|----------|--------|---------------------|------------|-------|-------------|-------|
| | R. A. | | Dec. | | Measured. | | From Curve. | |
| | " | <i>s</i> | " | | H. | P. | H. | P. |
| <i>p'</i> | -637 | -74.3 | - 822 | .... | .... | .... | .... | .... |
| <i>o</i> | -536 | -62.5 | - 945 | 27.2 | .... | .... | 9.17 | 8.90 |
| <i>q</i> | -509 | -59.4 | + 328 | .... | .... | .... | .... | .... |
| <i>l</i> | -457 | -53.3 | - 170 | 23.2 | 9.87 | 9.60 | .... | .... |
| <i>o'</i> | -438 | -51.1 | + 343 | .... | .... | .... | .... | .... |
| <i>B</i> | -397 | -46.4 | - 387 | .... | 8.35 | 8.08 | .... | .... |
| <i>k</i> | -186 | -21.7 | + 112 | 4.4 | .... | .... | 13.09 | 12.82 |
| <i>h</i> | -125 | -14.6 | + 92 | 7.1 | .... | .... | 12.60 | 12.33 |
| <i>s</i> | -122 | -14.2 | - 426 | .... | 10.10 | 9.83 | .... | .... |
| <i>p</i> | -122 | -14.2 | + 406 | .... | .... | .... | .... | .... |
| <i>g</i> | - 87 | -10.2 | + 64 | 6.0 | 12.82 | 12.55 | .... | .... |
| <i>b</i> | + 1 | + 0.1 | + 50 | 19.6 | 10.46 | 10.19 | .... | .... |
| <i>d</i> | + 19 | + 2.2 | + 141 | 10.8 | 11.43 | 11.16 | .... | .... |
| <i>f</i> | + 23 | + 2.7 | + 6 | 7.8 | 12.13 | 11.86 | .... | .... |
| <i>A</i> | + 49 | + 5.7 | - 470 | .... | 7.77 | 7.50 | .... | .... |
| <i>z*</i> | + 51 | + 6.0 | - 73 | 0.0 | 14.01 | 13.74 | .... | .... |
| <i>e</i> | + 54 | + 6.3 | + 50 | 5.9 | .... | .... | 12.83 | 12.56 |
| <i>a</i> | + 60 | + 7.0 | - 103 | 2.1 | 13.53 | 13.26 | .... | .... |
| <i>c</i> | + 110 | + 12.8 | + 111 | 16.3 | 10.71 | 10.44 | .... | .... |
| <i>n</i> | + 128 | + 14.9 | + 497 | .... | .... | .... | .... | .... |
| <i>t</i> | + 223 | + 26.0 | - 505 | .... | .... | .... | .... | .... |
| <i>β</i> | + 393 | + 45.8 | + 1287 | 31.8 | .... | .... | 8.40 | 8.13 |
| <i>m</i> | + 426 | + 49.7 | + 150 | 25.0 | 10.02 | 9.75 | .... | .... |
| <i>r</i> | + 479 | + 55.9 | + 139 | .... | .... | .... | .... | .... |

*The preceding component.



Scale, 1 mm = 13".6.

S

1902 August 15.

8629 Y CASSIOPEIÆ.

R. A. 23h 58m 13s.8. Dec. +55° 7' 25", 1900.

TABLE III.—8629 Y CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

| 1904 October 6. | | | 6-INCH. | | | | Fine. | |
|---------------------|------------|-------------------------|-----------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> 21 38 | ° 27 | <i>Ca</i> ₁ | 12.6 12.7 12.1 | 12.27 | 12.12 | 0.52 | 7.98 | 7.71 |
| | | <i>m</i> | 28.8 30.0 30.0 | 29.60 | 29.59 | 2.63 | 10.09 | 9.82 |
| | | <i>v</i> | 34.9 36.1 35.3 | 35.43 | ..... | 3.40 | 10.86 | 10.59 |
| | | <i>A</i> | 10.2 10.2 10.0 | 10.13 | 10.53 | 0.35 | 7.81 | 7.54 |
| | | <i>B</i> | 15.1 15.0 15.0 | 15.03 | 14.85 | 0.91 | 8.37 | 8.10 |
| | | <i>l</i> | 28.1 28.0 27.9 | 28.00 | 27.19 | 2.36 | 9.82 | 9.55 |
| | | <i>F'</i> _{a1} | 10.0 10.0 9.2 | 13.63 | 9.42 | 0.23 | 7.69 | 7.42 |
| | | <i>G</i> _{a1} | 12.9 14.3 13.7 | 13.63 | 13.52 | 0.72 | 8.18 | 7.91 |
| | | <i>G</i> _{a1} | 13.1 13.8 13.3 | 13.40 | ..... | ..... | ..... | ..... |
| | | <i>F'</i> _{a1} | 8.8 9.6 8.9 | 9.10 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 26.1 25.8 27.2 | 26.37 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 14.3 15.0 14.7 | 14.67 | ..... | ..... | ..... | ..... |
| | | <i>A</i> | 10.9 11.1 10.8 | 10.93 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 29.7 30.0 29.0 | 29.57 | ..... | ..... | ..... | ..... |
| 21 56 | 25 | <i>Ca</i> ₁ | 12.2 11.7 12.0 | 11.97 | ..... | ..... | ..... | ..... |
| 1904 October 15. | | | Good. | | | | | |
| 0 26 | 16 | <i>G</i> _{a1} | 16.9 18.4 17.5 | 17.60 | 17.20 | 1.24 | 8.28 | 8.01 |
| | | <i>G</i> | 10.3 11.0 11.2 | 10.83 | ..... | 0.37 | 7.41 | 7.14 |
| | | <i>F'</i> _{a1} | 10.8 11.3 10.2 | 10.77 | 11.82 | 0.49 | 7.53 | 7.26 |
| | | <i>l</i> | 31.7 32.1 32.2 | 32.00 | 31.47 | 2.86 | 9.90 | 9.63 |
| | | <i>B</i> | 17.1 18.1 18.1 | 17.77 | 17.97 | 1.35 | 8.39 | 8.12 |
| | | <i>s</i> | 32.9 33.1 32.7 | 32.90 | ..... | 3.04 | 10.08 | 9.81 |
| | | <i>A</i> | 13.1 14.0 13.4 | 13.50 | 14.02 | 0.78 | 7.82 | 7.55 |
| | | <i>m</i> | 31.7 32.9 32.4 | 32.33 | 32.67 | 3.02 | 10.06 | 9.79 |
| | | <i>C</i> | 10.0 10.0 9.2 | 9.73 | 9.65 | 0.25 | 7.29 | 7.02 |
| | | <i>C</i> | 10.1 8.9 9.7 | 9.57 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 32.0 33.6 33.4 | 33.00 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 35.6 36.1 34.7 | 35.47 | ..... | 3.40 | 10.44 | 10.17 |
| | | <i>A</i> | 15.0 13.9 14.7 | 14.53 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 18.3 18.0 18.2 | 18.17 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 31.0 30.7 31.1 | 30.93 | ..... | ..... | ..... | ..... |
| | | <i>F'</i> _{a1} | 13.4 12.6 12.8 | 12.87 | ..... | ..... | ..... | ..... |
| 0 50 | 18 | <i>G</i> _{a1} | 17.1 16.4 16.9 | 16.80 | ..... | ..... | ..... | ..... |
| 1904 October 27. | | | Fine. | | | | | |
| 21 0 | 31 | <i>G</i> _{a1} | 12.7 13.7 13.6 | 13.33 | 13.33 | 0.68 | 8.09 | 7.82 |
| | | <i>F'</i> _{a1} | 9.6 8.6 9.2 | 9.13 | 9.62 | 0.25 | 7.66 | 7.39 |
| | | <i>l</i> | 27.5 28.0 27.6 | 27.70 | 28.10 | 2.47 | 9.88 | 9.61 |
| | | <i>B</i> | 13.7 13.9 13.6 | 13.73 | 14.52 | 0.87 | 8.28 | 8.01 |
| | | <i>s</i> | 27.8 28.0 29.0 | 28.27 | ..... | 2.47 | 9.88 | 9.61 |
| | | <i>A</i> | 9.1 10.4 9.8 | 9.77 | 10.05 | 0.28 | 7.69 | 7.42 |
| | | <i>v</i> | 23.2 24.4 24.0 | 23.87 | ..... | 2.03 | 9.44 | 9.17 |
| | | <i>m</i> | 28.0 28.2 28.1 | 28.10 | 28.52 | 2.51 | 9.92 | 9.65 |
| | | <i>Ca</i> ₁ | 12.9 12.9 13.8 | 13.20 | 13.29 | 0.68 | 8.09 | 7.82 |
| | | <i>Ca</i> ₁ | 13.3 14.0 12.8 | 13.37 | ..... | ..... | ..... | ..... |
| | | <i>m</i> | 29.0 28.5 29.3 | 28.93 | ..... | ..... | ..... | ..... |
| | | <i>A</i> | 9.6 10.3 11.1 | 10.33 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 15.1 15.8 15.0 | 15.30 | ..... | ..... | ..... | ..... |
| | | <i>l</i> | 28.5 28.1 28.9 | 28.50 | ..... | ..... | ..... | ..... |
| | | <i>F'</i> _{a1} | 10.0 10.1 10.1 | 10.07 | ..... | ..... | ..... | ..... |
| 21 18 | 28 | <i>G</i> _{a1} | 13.2 13.0 13.8 | 13.33 | ..... | ..... | ..... | ..... |

TABLE III.—8629 Y CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1904 September 2. | | | 12-INCH. | | | | Good. | |
|-------------------|------------|-----------------------|-----------------------------------|----------------------|------------|-------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | | | | | | | |
| 19 35 | 44 | <i>l</i> | 20.0 20.9 21.0 | 20.63 | 20.60 | 1.78 | 9.84 | 9.57 |
| | | <i>B</i> | 5.0 6.7 5.6 | 5.77 | 6.32 | 0.22 | 8.28 | 8.01 |
| | | <i>B_{at}</i> | 14.2 14.4 14.8 | 14.47 | 14.57 | 1.00 | 9.06 | 8.79 |
| | | <i>A_{at}</i> | 10.7 10.1 10.1 | 10.30 | 10.00 | 0.44 | 8.50 | 8.23 |
| | | <i>v</i> | 36.2 36.8 36.9 | 36.63 | ..... | 3.40 | 11.46 | 11.19 |
| | | <i>b</i> | 27.9 28.0 28.1 | 28.00 | 27.62 | 2.43 | 10.49 | 10.22 |
| | | <i>d</i> | 35.0 35.1 35.0 | 35.03 | 35.72 | 3.27 | 11.33 | 11.06 |
| | | <i>c</i> | 30.0 29.3 30.2 | 29.83 | 30.22 | 2.67 | 10.73 | 10.46 |
| | | <i>m</i> | 22.0 23.1 23.1 | 22.73 | 22.98 | 2.01 | 10.07 | 9.80 |
| | | <i>m</i> | 23.2 22.9 23.6 | 23.23 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 31.0 30.9 29.9 | 30.60 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 36.6 36.4 36.2 | 36.40 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 26.1 28.7 26.9 | 27.23 | ..... | ..... | ..... | ..... |
| | | <i>A_{at}</i> | 9.0 10.1 10.0 | 9.70 | ..... | ..... | ..... | ..... |
| | | <i>B_{at}</i> | 14.0 15.1 14.9 | 14.67 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 6.7 7.2 6.7 | 6.87 | ..... | ..... | ..... | ..... |
| 19 52 | 40 | <i>l</i> | 20.7 20.7 20.3 | 20.57 | ..... | ..... | ..... | ..... |
| 1904 November 2. | | | Fair, a little dull and unsteady. | | | | | |
| 21 2 | 31 | <i>l</i> | 25.6 24.4 25.1 | 25.03 | 25.87 | 2.27 | 9.87 | 9.60 |
| | | <i>B</i> | 12.0 12.0 11.8 | 11.93 | 12.10 | 0.69 | 8.29 | 8.02 |
| | | <i>s</i> | 27.8 28.8 28.2 | 28.27 | 28.64 | 2.52 | 10.12 | 9.85 |
| | | <i>A_{at}</i> | 14.9 14.6 15.0 | 14.83 | 13.83 | 0.90 | 8.50 | 8.23 |
| | | <i>v</i> | 19.7 19.7 18.9 | 19.43 | ..... | 1.64 | 9.24 | 8.97 |
| | | <i>b</i> | 32.3 32.1 32.1 | 32.17 | 32.45 | 2.90 | 10.50 | 10.23 |
| | | <i>d</i> | 42.7 42.5 42.1 | 42.43 | 41.70 | 3.97 | 11.57 | 11.30 |
| | | <i>c</i> | 33.2 33.9 32.9 | 33.33 | 33.72 | 3.05 | 10.65 | 10.38 |
| | | <i>m</i> | 27.3 28.0 27.4 | 27.57 | 27.69 | 2.43 | 10.03 | 9.76 |
| | | <i>m</i> | 27.9 27.8 27.7 | 27.80 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 34.8 34.1 33.4 | 34.10 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 40.4 40.9 41.6 | 40.97 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 32.1 33.3 32.8 | 32.73 | ..... | ..... | ..... | ..... |
| | | <i>A_{at}</i> | 12.8 12.4 13.3 | 12.83 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 29.1 29.2 28.7 | 29.00 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 12.1 12.6 12.1 | 12.27 | ..... | ..... | ..... | ..... |
| 21 24 | 28 | <i>l</i> | 26.6 27.1 26.1 | 26.70 | ..... | ..... | ..... | ..... |
| 1904 November 3. | | | Good. | | | | | |
| 21 1 | 30 | <i>m</i> | 24.9 25.3 25.1 | 25.10 | 24.59 | 2.26 | 10.22 | 9.95 |
| | | <i>c</i> | 31.9 30.9 31.1 | 31.30 | 31.39 | 2.78 | 10.74 | 10.47 |
| | | <i>d</i> | 36.5 37.6 36.7 | 36.93 | 37.25 | 3.44 | 11.40 | 11.13 |
| | | <i>b</i> | 28.0 28.7 27.8 | 28.17 | 27.79 | 2.44 | 10.40 | 10.13 |
| | | <i>v</i> | 16.2 16.6 16.4 | 16.40 | ..... | 1.24 | 9.20 | 8.93 |
| | | <i>A_{at}</i> | 10.1 10.1 9.2 | 9.80 | 9.40 | 0.37 | 8.33 | 8.06 |
| | | <i>s</i> | 24.5 24.9 24.3 | 24.57 | 24.15 | 2.12 | 10.08 | 9.81 |
| | | <i>B</i> | 8.2 7.9 6.9 | 7.63 | 7.52 | 0.21 | 8.17 | 7.90 |
| | | <i>l</i> | 23.2 22.8 23.2 | 23.07 | 22.94 | 2.01 | 9.97 | 9.80 |
| | | <i>l</i> | 22.7 23.3 22.4 | 22.80 | ..... | ..... | ..... | ..... |
| | | <i>B</i> | 7.8 7.1 7.3 | 7.40 | ..... | ..... | ..... | ..... |
| | | <i>s</i> | 23.0 24.1 24.2 | 23.77 | ..... | ..... | ..... | ..... |
| | | <i>A_{at}</i> | 8.2 9.8 9.0 | 9.00 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 27.5 27.0 27.7 | 27.40 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 38.0 37.4 37.3 | 37.57 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 31.2 31.2 32.1 | 31.47 | ..... | ..... | ..... | ..... |
| 21 20 | 28 | <i>m</i> | 24.2 24.0 24.0 | 24.07 | ..... | ..... | ..... | ..... |

TABLE III.—8629 Y CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

| 1902 December 26. | | | 40-INCH. | | | Clear, unsteady. | | |
|-------------------|------------|------------|---------------------------------------|----------------------|------------|------------------|------------|-------|
| Sidereal Time. | Zen. Dist. | Star. | Scale Readings. | Mean Scale Readings. | | C. | Magnitude. | |
| | | | | Mean of 3. | Mean of 6. | | H. | P. |
| <i>h m</i> | <i>°</i> | <i>c</i> | 16.9 18.5 17.9 | 17.77 | 18.39 | 1.49 | 10.84 | 10.57 |
| 4 25 | | <i>d</i> | 25.0 24.3 25.0 | 24.77 | 25.47 | 2.24 | 11.59 | 11.32 |
| | | <i>b</i> | 12.8 12.9 13.4 | 13.03 | 13.30 | 0.82 | 10.17 | 9.90 |
| | | <i>v</i> | 30.7 30.1 31.0 | 30.60 | ..... | 2.71 | 12.06 | 11.79 |
| | | <i>f</i> | 30.8 32.1 31.9 | 31.60 | 31.04 | 2.76 | 12.11 | 11.85 |
| | | <i>a</i> | 44.8 43.8 43.7 | 44.10 | 44.27 | 4.25 | 13.60 | 13.33 |
| | | <i>a</i> | 44.7 44.4 44.2 | 44.43 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 29.8 30.7 30.9 | 30.47 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 14.3 12.6 13.8 | 13.57 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 25.8 26.4 26.3 | 26.17 | ..... | ..... | ..... | ..... |
| | | <i>c</i> | 19.2 18.5 19.3 | 19.00 | ..... | ..... | ..... | ..... |
| 1905 January 7. | | | Clear, unsteady. | | | | | |
| | | <i>c</i> | 14.0 14.9 15.3 | 14.73 | 14.92 | 1.04 | 10.75 | 10.48 |
| | | <i>d</i> | 21.9 21.8 22.2 | 21.97 | 22.87 | 2.06 | 11.77 | 11.50 |
| | | <i>b</i> | 7.2 8.6 9.1 | 8.30 | 9.24 | 0.37 | 10.08 | 9.81 |
| | | <i>f</i> | 26.2 29.3 28.7 | 28.07 | 28.35 | 2.50 | 12.21 | 11.94 |
| | | <i>a</i> | 36.3 37.1 37.7 | 37.03 | 37.33 | 3.47 | 13.18 | 12.91 |
| | | <i>a</i> | 37.3 37.5 38.1 | 37.63 | ..... | ..... | ..... | ..... |
| | | <i>vax</i> | 16.1 16.0 14.8 | 15.63 | ..... | 1.15 | 10.86 | 10.59 |
| | | <i>f</i> | 28.3 28.6 29.0 | 28.63 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 11.0 9.2 10.3 | 10.17 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 24.6 22.2 24.5 | 23.77 | ..... | ..... | ..... | ..... |
| 4 6 | 42 | <i>c</i> | 13.9 16.3 16.1 | 15.10 | ..... | ..... | ..... | ..... |
| 1905 January 28. | | | Good. | | | | | |
| 4 10 | | <i>c</i> | 13.2 13.8 12.8 | 13.93 | 13.32 | 0.83 | 10.78 | 10.51 |
| | | <i>d</i> | 20.3 20.3 21.1 | 20.57 | 20.04 | 1.72 | 11.67 | 11.40 |
| | | <i>b</i> | 4.8 7.9 8.3 | 7.00 | 7.40 | 0.20 | 10.15 | 9.88 |
| | | <i>v</i> | 9.2 8.1 8.2 | 8.50 | 8.20 | 0.26 | 10.21 | 9.94 |
| | | <i>f</i> | 22.8 25.7 24.9 | 24.47 | 24.52 | 2.17 | 12.12 | 11.85 |
| | | <i>a</i> | 38.3 37.2 37.3 | 37.60 | 37.02 | 3.44 | 13.39 | 13.12 |
| | | <i>a</i> | 36.4 36.9 36.0 | 36.43 | ..... | ..... | ..... | ..... |
| | | <i>f</i> | 25.2 24.4 24.1 | 24.57 | ..... | ..... | ..... | ..... |
| | | <i>v</i> | 7.4 8.2 8.1 | 7.90 | ..... | ..... | ..... | ..... |
| | | <i>b</i> | 7.3 7.8 8.3 | 7.80 | ..... | ..... | ..... | ..... |
| | | <i>d</i> | 18.8 20.2 19.5 | 19.50 | ..... | ..... | ..... | ..... |
| 4 20 | 44 | <i>c</i> | 12.1 13.7 12.3 | 12.70 | ..... | ..... | ..... | ..... |
| | | <i>g</i> | 24.1 23.7 24.0 | 23.93 | ..... | 2.20 | 12.15 | 11.88 |
| 1900 July 12. | | | WEDGE II. | | | Fair, moon. | | |
| | | <i>b</i> | 13.2 15.5 13.0 } 11.8 11.8 } | 13.06 | ..... | 0.42 | 10.06 | 9.79 |
| | | <i>f</i> | 24.0 25.8 28.0 } 27.0 } | 26.20 | 26.36 | 2.44 | 12.08 | 11.81 |
| | | <i>d</i> | 24.7 26.0 25.1 } 24.4 } | 25.05 | ..... | 2.26 | 11.90 | 11.63 |
| | | <i>c</i> | 17.0 16.1 16.4 } 18.0 } | 16.88 | ..... | 1.00 | 10.64 | 10.37 |
| | | <i>g</i> | 34.0 32.4 33.0 } 32.3 } | 32.93 | ..... | 3.19 | 12.83 | 12.56 |
| | | <i>z</i> | 43.5 } | 43.5 | ..... | 4.32 | 13.96 | 13.69 |
| | | <i>a</i> | 43.7 45.0 43.7 } 42.4 } | 43.20 | ..... | 4.30 | 13.94 | 13.67 |
| | | <i>f</i> | 24.0 27.7 29.2 } 25.2 } | 26.53 | ..... | ..... | ..... | ..... |
| 22 20 | | <i>v</i> | 15.9 15.2 | 15.55 | ..... | 0.77 | 10.41 | 10.14 |

TABLE 112.—8629 Y CASSIOPEIÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

| 6-INCH. | | | | | | | | | | | | | | | |
|----------------------|-----------------|-----------|------|---------------|-----------|------------------|-----------|------|---------------|-----------|------------------|-----------|------|---------------|-----------|
| Star. | 1904 October 6. | | | | | 1904 October 15. | | | | | 1904 October 27. | | | | |
| | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | | C. | Obs. Mag. | | Δ Mag. | |
| | | H. | P. | H. | P. | | H. | P. | H. | P. | | H. | P. | H. | P. |
| C..... | -0.23 | 7.23 | 6.96 | + .12 | -.09 | 0.25 | 7.29 | 7.02 | + .18 | -.03 | -0.07 | 7.34 | 7.07 | + .23 | +.02 |
| F'..... | -0.52 | 6.94 | 6.67 | -.07 | + .10 | -0.26 | 6.78 | 6.51 | -.23 | -.06 | -0.50 | 6.91 | 6.64 | -.10 | +.07 |
| G..... | -0.03 | 7.43 | 7.16 | -.05 | .00 | 0.49 | 7.53 | 7.26 | + .05 | + .10 | -0.07 | 7.34 | 7.07 | -.14 | -.09 |
| Means. | -0.26 | 7.20 | 6.93 | \pm .08 | \pm .06 | 0.16 | 7.20 | 6.93 | \pm .15 | \pm .06 | -0.21 | 7.20 | 6.93 | \pm .16 | \pm .06 |
| M ₀..... | .... | 7.46 | 7.19 | ... | ... | .... | 7.04 | 6.77 | ... | ... | .... | 7.41 | 7.14 | ... | ... |

| 12-INCH. | | | | | 40-INCH. | | | | | |
|----------------------|-----------------|----------|---------|---------|----------------------|------------------|----------|---------|----------|----------|
| Star. | Mag. 6-inch. | C. | | | Star. | Mag. 12-inch. | C. | | | |
| | | Sept. 2. | Nov. 2. | Nov. 3. | | | Dec. 26. | Jan. 7. | July 12. | Jan. 28. |
| A..... | 7.77 | -0.40 | 0.06 | -0.47 | b..... | 10.46 | 0.82 | 0.37 | 0.42 | 0.20 |
| B..... | 8.35 | 0.22 | 0.69 | 0.21 | c..... | 10.71 | 1.49 | 1.04 | 1.00 | 0.83 |
| l..... | 9.87 | 1.78 | 2.27 | 2.01 | d..... | 11.43 | 2.24 | 2.06 | 2.26 | 1.72 |
| m..... | 10.02 | 2.01 | 2.43 | 2.26 | | | | | | |
| Mean C.... | .... | 0.90 | 1.36 | 1.21 | Mean C.... | .... | 1.52 | 1.16 | 1.23 | 0.92 |
| Mean Mag.. | 8.96 | 8.96 | 8.96 | 8.96 | Mean Mag.. | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 |
| M ₀..... | .... | 8.06 | 7.60 | 7.96 | M ₀..... | .... | 9.35 | 9.71 | 9.64 | 9.95 |

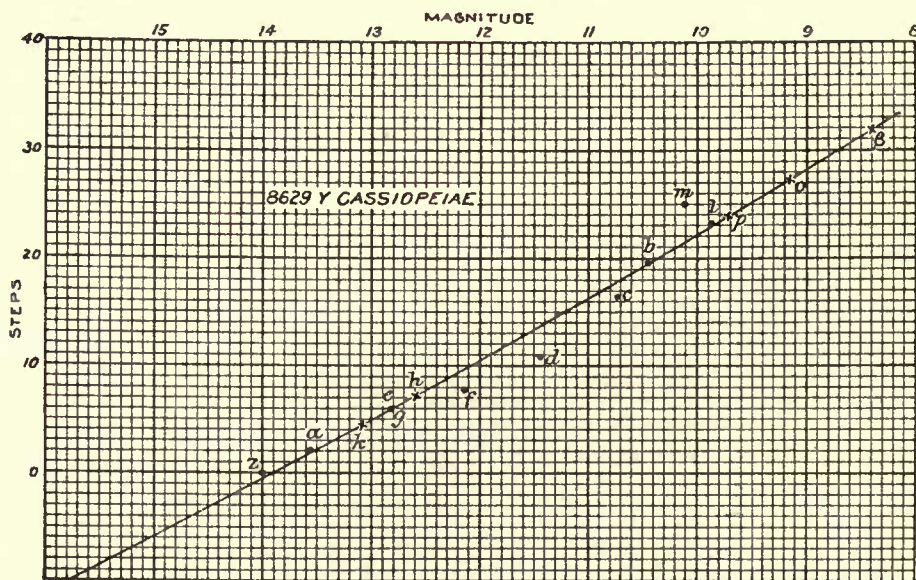


FIG. 37.—MAGNITUDE-CURVE FOR Y CASSIOPEIÆ.

[illegible]

TABLE 114.—8629 Y CASSIOPEÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

| No. | Date. | | | Ocular. | Aperture. | Comparisons. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|-------------|---------------------|---------|-----------|------------------------------|------------------------|--------|--------|---------|-----|--------|
| | Month and Day. | Hour C.S.T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 1 | 1898 Feb. 15 | 8 | 2410000+ 4336.58 | 150 | 6 | {v2b, b2c, c4d, d3h, h1-2g.} | ..... | 21.6 | 10.07 | .... | 0 | +0.32 |
| 2 | 23 | 7 | 4344.54 | 150 | 6 | {v2b, b1c, c6d, d5f, f2e...} | ..... | 21.6 | 10.07 | good | 8 | +0.37 |
| 3 | 24 | 7 | 4345.54 | ... | 6 | {d2h, h1g, g2k, g2j...} | ..... | 25.0 | 9.50 | .... | 9 | -0.20 |
| 4 | Mar. 4 | 7 | 4353.54 | 150 | 6 | v4b, v2l, v1-2m, o2v, v1p.. | {23.6, 25.2, 26.5...} | 24.3 | 9.61 | good | 17 | -0.12 |
| 5 | 5 | 7 | 4354.54 | 80 | 6 | v2-3l, m0-1v, v3-4b..... | {25.2, 24.9...} | 25.6 | 9.43 | fair | 18 | -0.31 |
| 6 | 13 | 7 | 4362.54 | 150 | 6 | ov, v2p, v2-3l, D2-3v..... | 27.2, 25.9, 25.7...} | 23.9 | 9.70 | good | 26 | -0.13 |
| 7 | 16 | 7 | 4365.54 | 40 | 6 | v2l, v1-2m, ov, v4b..... | 25.2, 26.5, 27.2, 23.6 | 25.5 | 9.43 | good | 29 | -0.46 |
| 8 | 23 | 7 | 4372.54 | 150 | 6 | v2l, v3b, m1v..... | 25.2, 22.6, 24.0...} | 24.9 | 9.53 | good | 36 | -0.45 |
| 9 | 28 | 7 | 4377.54 | 40 | 6 | o1v, v2m, v3l..... | 26.2, 27.0, 26.2...} | 24.4 | 9.60 | good | 41 | -0.50 |
| 10 | Apr. 6 | 7 | 4386.54 | 150 | 6 | v4b, m1v, v3l..... | 23.6, 24.0, 26.2...} | 21.6 | 10.07 | fair | 50 | -0.20 |
| 11 | 20 | 8 | 4400.58 | 150 | 6 | v3l, vm, v4b..... | 26.2, 25.0, 23.6...} | 20.9 | 10.19 | fair | 64 | -0.44 |
| 12 | 25 | 9 | 4405.60 | 150 | 6 | o4v, v1p, v2m..... | 23.2, 24.9, 27.0...} | 18.4 | 10.61 | fair | 69 | -0.16 |
| 13 | June 21 | 13 | 4462.79 | 80 | 12 | vo-1m, v2b..... | 25.5, 21.6...} | 11.5 | 11.80 | good | 126 | -0.62 |
| 14 | July 6 | 11 | 4477.71 | 275 | 12 | m3v, l2v..... | 22.0, 21.2...} | 6.1 | 12.79 | good | 141 | +0.08 |
| 15 | Aug. 1 | 11 | 4503.71 | 175 | 12 | m3v, l1-2v, v1-2b..... | 22.0, 21.7, 21.1...} | 5.2 | 12.95 | moon | 167 | -0.16 |
| 16 | 9 | 9 | 4511.63 | 175 | 12 | m2-3v, l2-3v, vb..... | 22.5, 20.7, 19.6...} | 3.7 | 13.14 | good | 175 | -0.07 |
| 17 | 18 | 10 | 4520.67 | 275 | 12 | b2-3v, v3-4c..... | 17.1, 19.8...} | 3.6 | 13.15 | good | 184 | -0.18 |
| 18 | Sept. 7 | 9 | 4540.63 | 150 | 6 | c3v, do-1v, v3f..... | 13.6, 10.3, 10.8...} | 1.6 | 13.60 | good | 204 | +0.10 |
| 19 | Oct. 5 | 8 | 4568.58 | 150 | 6 | fo-1v, v2e..... | 7.3, 7.9...} | < 0 | < 13.9 | good | ... | ... |
| 20 | Nov. 5 | 7 | 4599.54 | 150 | 6 | f2v, ev, v1g, v3z..... | 5.8, 5.9, 7.0, 3.0...} | < 1 | < 13.7 | good | ... | ... |
| 21 | 19 | 7 | 4613.54 | 200 | 6 | e1-2v, g2v, limit v..... | 6.4, 4.0...} | < 0 | < 13.9 | good | ... | ... |
| 22 | 30 | 7 | 4624.52 | 150 | 6 | e2v, v3-4z..... | 3.9, 3.5...} | < 0 | < 13.9 | good | ... | ... |
| 23 | Dec. 7 | 7 | 4631.54 | 200 | 6 | e2v, v3z, v2a..... | 3.9, 3.0, 4.1...} | < 0 | < 13.9 | good | ... | ... |
| 24 | 10 | 6 | 4634.50 | 200 | 6 | f6v, g4v, v1z, limit z..... | 1.8, 2.0, 1.0...} | 3.1 | 13.33 | good | 295 | -0.34 |
| 25 | 26 | 8 | 4650.58 | 200 | 6 | v not seen, limit z..... | ..... | 2.1 | 13.50 | good | 298 | -0.15 |
| 26 | 30 | 7 | 4654.54 | 200 | 6 | v not seen, limit z..... | ..... | 4.1 | 13.16 | good | 318 | -0.25 |
| 27 | 1899 Jan. 6 | 7 | 4661.52 | 200 | 6 | v not seen, limit z..... | ..... | 3.9 | 13.19 | good | 325 | -0.10 |
| 28 | 14 | 7 | 4669.54 | 200 | 6 | v glimpsed, v1a..... | ..... | 4.4 | 13.08 | good | 333 | -0.02 |
| 29 | 27 | 6 | 4682.50 | 150 | 6 | v glimpsed, va..... | ..... | 5.5 | 12.90 | good | 346 | +0.15 |
| 30 | Feb. 7 | 7 | 4693.54 | 200 | 6 | v not seen..... | ..... | 6.7 | 12.70 | good | 357 | +0.40 |
| 31 | 28 | 8 | 4714.58 | 150 | 6 | v2a..... | ..... | 12.4 | 11.67 | good | 378 | +0.67 |
| 32 | Mar. 7 | 7 | 4721.54 | 150 | 6 | v3-4z, e1-2v..... | 3.5, 4.4...} | 19.2 | 10.47 | fair | 385 | +0.07 |
| 33 | 13 | 8 | 4727.58 | 150 | 6 | v4z, e1v..... | 4.0, 4.9...} | 22.0 | 10.00 | fair | 391 | -0.19 |
| 34 | 28 | 8 | 4732.56 | 40 | 6 | v4a, vo-1e, g2v..... | 6.1, 6.4, 4.0...} | 27.6 | 9.09 | good | 396 | -0.88 |
| 35 | Apr. 4 | 8 | 4749.58 | 40 | 6 | v3e, f3-4v, v1g..... | 8.9, 4.3, 7.0...} | 26.6 | 9.26 | good | 3 | -0.47 |
| 36 | 16 | 16 | 4761.92 | 40 | 6 | v2d, v4f, c5v, v8g, d3f... | 12.8, 11.8, 11.3, 14.0 | 26.5 | 9.27 | fair | 16 | -0.46 |
| 37 | May 1 | 16 | 4776.92 | 40 | 6 | b1v, v1c, v10-12d..... | 18.6, 17.3, 21.8...} | 26.4 | 9.29 | fair | 30 | -0.61 |
| 38 | 21 | 14 | 4796.83 | 150 | 6 | v1-2b, m2v..... | 21.1, 23.0...} | 19.2 | 10.47 | good | 50 | +0.18 |
| 39 | 29 | 10 | 4804.67 | 150 | 6 | v3-4m, v3-4l, v10..... | 28.5, 26.7, 27.2...} | 16.2 | 10.97 | fair | 58 | +0.51 |
| 40 | June 7 | 10 | 4813.67 | 150 | 6 | o1-2v, v3l, v3m..... | 25.7, 26.2, 28.0...} | 15.4 | 11.12 | fair | 67 | +0.41 |
| 41 | 15 | 10 | 4821.65 | 150 | 6 | o6v, o1v, v3m, v3l..... | 25.8, 26.2, 28.0, 26.2 | 12.5 | 11.63 | low | 75 | +0.63 |
| 42 | July 5 | 10 | 4841.65 | 150 | 6 | v2m, v2l, vo, v2p, o5v.... | {27.0, 25.2, 27.2...} | 8.8 | 12.31 | good | 95 | +0.64 |
| 43 | 11 | 10 | 4847.65 | 150 | 6 | l5v, m6v, v1b..... | {25.9, 26.8...} | 8.5 | 12.35 | poor | 101 | +0.53 |
| 44 | 17 | 10 | 4853.65 | 150 | 6 | l6v, b3v, v1-2c..... | 18.2, 19.0, 20.6...} | 6.8 | 12.68 | moon | 107 | +0.71 |
| 45 | Aug. 6 | 9 | 4873.63 | 150 | 6 | b3v, co-1v, v4d..... | 17.2, 16.6, 14.8...} | 4.9 | 13.02 | fair | 127 | +0.59 |
| 46 | 26 | 9 | 4893.60 | 150 | 6 | c3-4v, v1-2d..... | 16.6, 15.8, 14.8...} | 3.4 | 13.28 | fair | 147 | +0.46 |
| 47 | Sept. 13 | 8 | 4911.56 | 150 | 6 | d1v, vf, v4e..... | 12.8, 12.3...} | 4.4 | 13.10 | moon | 165 | 0.00 |
| 48 | 26 | 7 | 4924.54 | ... | 6 | d2-3v, v1f..... | 9.8, 7.8, 9.9...} | < 4 | < 13.2 | good | ... | ... |
| 49 | Oct. 2 | 8 | 4930.58 | 200 | 6 | f1v±..... | 8.3, 8.8...} | < 2 | < 13.5 | good | ... | ... |
| 50 | Nov. 6 | 7 | 4965.54 | 200 | 6 | erv, limit 2 < v..... | ..... | < 2 | < 13.5 | good | ... | ... |
| 51 | 20 | 7 | 4979.54 | 150 | 6 | v glimpsed, e2-3v..... | ..... | < 6 | < 12.8 | good | ... | ... |
| 52 | 27 | 7 | 4986.54 | 200 | 6 | v glimpsed, e1-2v..... | ..... | < 2 | < 13.5 | fine | ... | ... |
| 53 | Dec. 6 | 7 | 4995.54 | ... | 6 | v not seen, limit 2 < e..... | ..... | < 4 | < 13.2 | good | ... | ... |

TABLE 114.—8629 Y CASSIOPEÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

| No. | Date. | | | Ocular. | Aperture. | Comparison. | Reduction, Steps. | Means. | | Seeing. | t. | Δ Mag. |
|-----|----------------|---------------|---|-------------------|----------------|---|--------------------|--------|-------|---------|-------|--------|
| | Month and Day. | Hour C. S. T. | Julian Day G. M. T. | | | | | Steps. | Mag. | | | |
| 54 | 1900 Jan. 8 | 10 | 2410000+ 5028.67 5028.68 5028.68 | 350 350 350 | 40 40 40 | v not seen, limit 2 < f... eis double, 13 and 13½", 5" | ..... | -2.0 | 14.18 | fair | 282 | +0.45 |
| 55 | 24 | 7 | 5044.54 | 150 | 6 | v not seen, a glimpsed | ..... | <13.6 | ..... | ..... | ..... | ..... |
| 56 | Feb. 9 | 11 | 5060.71 | 275 | 12 | v not seen, limit a | ..... | <13.6 | moon | ..... | ..... | ..... |
| 57 | 10 | 7 | 5061.54 | 350 | 40 | g5v, a2-3v, v2-3z | 1.0, -0.4, 2.3 | 1.0 | 13.70 | ..... | 315 | +0.25 |
| 58 | 19 | 8 | 5070.56 | 150 | 6 | v not seen, limit e | ..... | <6 | <12.8 | ..... | ..... | ..... |
| 59 | 25 | 8 | 5076.56 | 175 | 12 | z1v, v1a, limit a | -1.0, 3.1 | 1.0 | 13.70 | good | 330 | +0.50 |
| 60 | Mar. 19 | 8 | 5098.56 | 150 | 6 | v glimpsed, e4v± | ..... | 1.9 | 13.55 | ..... | 350 | +1.10 |
| 61 | 21 | 8 | 5100.58 | 275 | 12 | v2a, v2z, g3v, e4v | 4.1, 2.0, 3.0, 1.9 | 2.7 | 13.40 | good | 354 | +1.03 |
| 62 | Apr. 4 | 8 | 5114.58 | 275 | 12 | e3-4v, v1g, v4-5a | 2.4, 7.0, 6.6 | 5.0 | 12.98 | good | 368 | +1.23 |
| 63 | May 1 | 15 | 5141.88 | 130 | 12 | c1-2v, v4d | 14.8, 14.8 | 14.8 | 11.23 | fair | 396 | +1.22 |
| 64 | 20 | 14 | 5160.83 | 150 | 6 | v8-10e, f2-3e | 14.9 | 17.9 | 10.71 | moon | 4 | +0.99 |
| 65 | June 15 | 10 | 5186.65 | 150 | 6 | b2-3v, v2-3c | 17.1, 18.1 | 15.0 | 11.03 | fair | 30 | +1.13 |
| 66 | July 12 | 15 | 5213.85 | 237 | 40 | a3v, v6, v3d | 15.0, 16.3, 13.8 | ..... | 10.41 | ..... | 57 | -0.04 |
| 67 | Aug. 14 | 9 | 5246.60 | 150 | 6 | photometer | ..... | 9.3 | 12.22 | fair | 90 | +0.53 |
| 68 | 28 | 9 | 5260.60 | 200 | 6 | l2-3b, b4-5c, d2v, v2f | 8.8, 9.8 | 9.3 | 12.22 | good | 104 | +0.25 |
| 69 | Oct. 16 | 10 | 5309.67 | 460 | 40 | d2v, v2f | 8.8, 9.8 | 6.8 | 12.68 | good | 153 | -0.28 |
| 70 | 25 | 7 | 5318.54 | 67 | 12 | f2v, v2e | 5.8, 7.9 | 1.5 | 13.72 | good | 162 | +0.65 |
| 71 | Nov. 26 | 7 | 5350.54 | 40 | 6 | g4v, v1z | 2.0, 1.0 | <6 | <12.8 | ..... | ..... | ..... |
| 72 | 1901 Feb. 10 | 7 | 5426.54 | 150 | 6 | v not seen, limit f | ..... | <8 | <12.4 | ..... | ..... | ..... |
| 73 | Dec. 21 | 8 | 5740.58 | 350 | 40 | vf | ..... | 7.8 | 12.47 | good | 174 | -0.74 |
| 74 | 1902 Aug. 15 | .. | 5977. | ... | 24 | photograph | ..... | ..... | 12.0 | ..... | ..... | ..... |
| 75 | Oct. 1 | 9 | 6024.62 | 237 | 40 | b4v, vic | 15.6, 17.3 | 16.4 | 10.95 | fair | 48 | +0.74 |
| 76 | 30 | 7 | 6053.54 | 67 | 12 | photometer | ..... | ..... | 11.26 | good | 77 | +0.25 |
| 77 | Dec. 26 | 10 | 6110.67 | 237 | 40 | photometer | ..... | ..... | 12.06 | fair | 134 | -0.54 |
| 78 | 1903 Oct. 10 | 8 | 6398.58 | 67 | 12 | v40, v7-8b | 31.2, 27.1 | 29.8 | 8.73 | good | 12 | -0.97 |
| 79 | Dec. 6 | 6 | 6455.50 | 40 | 6 | b4v, c2v, v4d | 15.6, 14.3, 14.8 | 14.9 | 11.22 | good | 69 | +0.49 |
| 80 | 1904 Aug. 4 | 9 | 6697.63 | 150 | 6 | d3v, v2e | 7.8, 7.9 | 7.8 | 12.47 | fair | 311 | -0.83 |
| 81 | 29 | 8 | 6722.58 | 150 | 6 | f1v, v2e | 6.8, 7.9 | 7.4 | 12.55 | good | 336 | -0.52 |
| 82 | Sept. 2 | 9 | 6726.63 | 67 | 12 | photometer | ..... | ..... | 11.46 | good | 340 | -1.45 |
| 83 | Oct. 6 | 9 | 6760.63 | 40 | 6 | photometer | ..... | ..... | 10.86 | fine | 374 | -0.34 |
| 84 | Nov. 3 | .. | 6788 | ... | 24 | photographs | ..... | ..... | ..... | ..... | ..... | ..... |
| 85 | 29 | 7 | 6814.54 | 40 | 6 | vl, vm | 23.2, 25.0 | 24.1 | 9.66 | good | 18 | -0.06 |
| 86 | 1905 Jan. 7 | 9 | 6853.63 | 237 | 40 | photometer | ..... | ..... | 10.02 | fair | 45 | -0.48 |
| 87 | 28 | 8 | 6874.58 | 237 | 40 | photometer | ..... | ..... | 10.21 | good | 78 | -0.82 |
| 88 | Feb. 9 | 8 | 6886.56 | 67 | 12 | b6v, vic, v5d | 13.6, 17.3, 15.8 | 15.4 | 11.12 | fair | 90 | -0.38 |
| 89 | Mar. 3 | 7 | 6908.54 | 275 | 12 | b5v, civ, v5d | 14.6, 15.3, 15.8 | 12.0 | 11.73 | fair | 112 | -0.39 |
| 90 | 24 | 8 | 6929.58 | 150 | 6 | c4v, vid | 12.3, 11.8 | 8.8 | 12.20 | low | 133 | -0.39 |
| 91 | May 22 | 14 | 6988.83 | 250 | 40 | c5v, v2d | 11.3, 12.8 | 5 | 13.0 | fair | 192 | -0.4± |
| 92 | June 4 | 15 | 7001.88 | 450 | 40 | d1v, vf± | 9.8, 7.8 | 2 | 13.5 | poor | 205 | 0.0± |
| 93 | 26 | 12 | 7023.73 | 300 | 12 | f8v, v8a | -0.2, 10.1 | -1 | 14.1 | fair | 227 | +0.4± |
| 94 | 27 | 15 | 7024.88 | 237 | 40 | va± | ..... | 0.1 | 13.89 | good | 228 | +0.23 |
| 95 | July 30 | 12 | 7057.75 | 237 | 40 | a3v± | ..... | 3.0 | 13.36 | good | 261 | -0.40 |
| 96 | Aug. 6 | 9 | 7064.63 | 237 | 40 | a2v | (-1.2), 3.1 | 2.0 | 13.52 | good | 268 | -0.24 |
| 97 | 22 | 11 | 7080.71 | 237 | 40 | f8-10v, v1a | (-1.2), 2.1 | 3.4 | 13.28 | good | 284 | -0.44 |
| 98 | 28 | 9 | 7086.63 | 150 | 6 | f6-7v, v3a | 1.3, 4.1 | 1 | 13.7 | fair | 290 | 0.0 |
| 99 | Sept. 2 | 11 | 7091.71 | 237 | 40 | z, a and v glimpsed | ..... | 4.5 | 13.07 | good | 295 | -0.60 |
| 100 | 17 | 8 | 7106.58 | 150 | 6 | f5-6v, v4-5a | 2.3, 6.6 | <6 | <12.8 | dull | ..... | ..... |
| 101 | 19 | 11 | 7108.71 | 237 | 40 | v not seen, limit e | ..... | 8.8 | 12.31 | good | 312 | -1.17 |
| 102 | Oct. 20 | 8 | 7139.56 | 80 | 12 | vf, f8a± | 8.8, 10 | 6.4 | 12.72 | good | 343 | -0.15 |
| 103 | 22 | 7 | 7141.54 | 237 | 40 | f5v, vie | 3.8, 6.9 | 4.9 | 13.01 | poor | 345 | +0.22 |
| 104 | 31 | 12 | 7150.75 | 237 | 40 | f4-5v, v6a± | 3.3, 8.1 | 10.3 | 12.03 | good | 354 | -0.37 |
| 105 | Nov. 21 | 6 | 7171.50 | 150 | 6 | v3f, div | 10.8, 9.8 | 11.6 | 11.81 | good | 375 | +0.71 |
| | | | | | | c5v, vid, v3-4f | 11.3, 11.8, 11.3 | ..... | ..... | ..... | ..... | ..... |

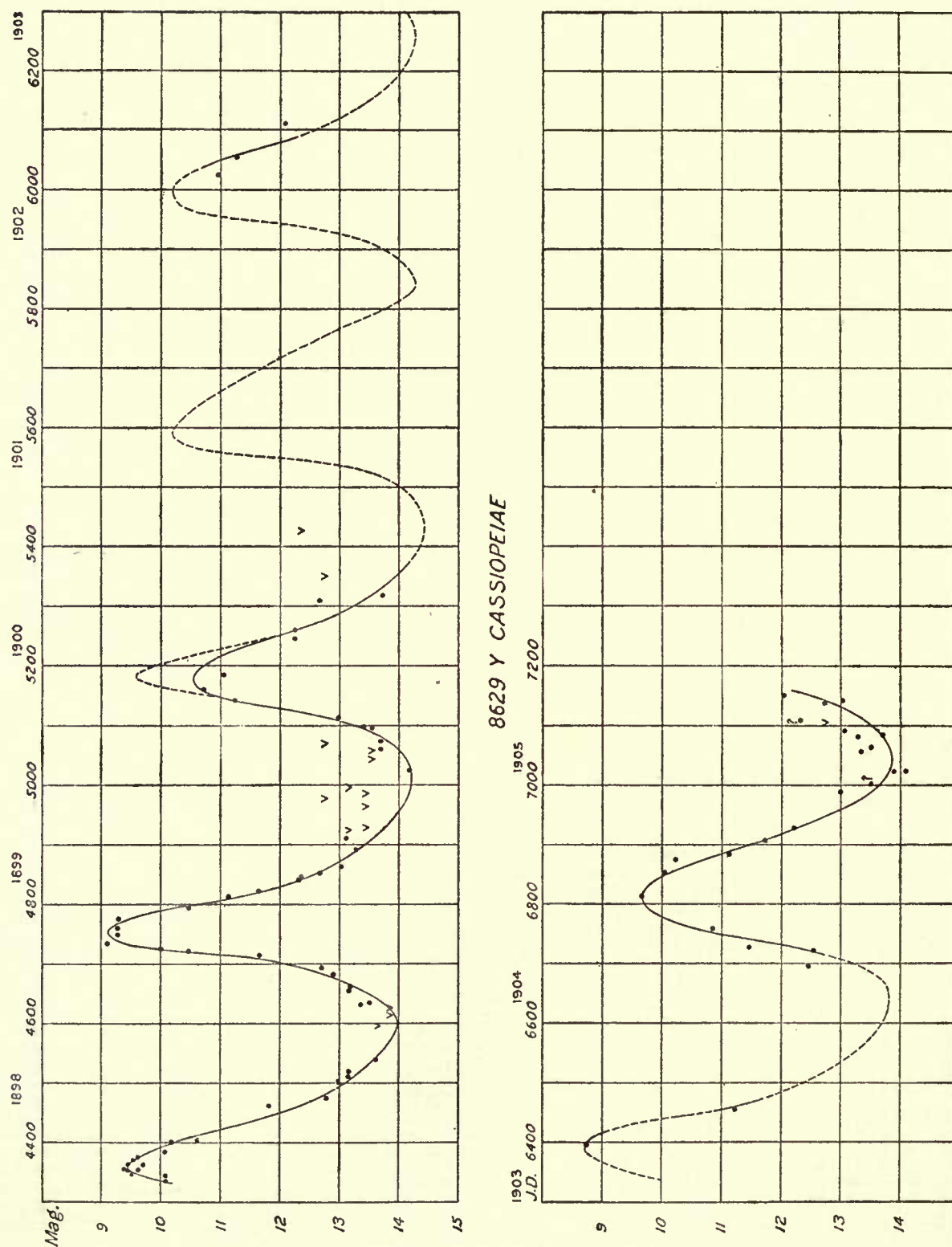


FIG. 38.—LIGHT-CURVE OF Y CASSIOPEIAE.

TABLE 115.—8629 Y CASSIOPEÆ. MEAN MAGNITUDES FROM 34½ DAY GROUPS.

| Group No ... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------|------------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|
| J. D. | 34 | 68 | 102 | 137 | 171 | 205 | 239 | 273 | 308 | 342 | 376 | 410 |
| 4336 | <i>t</i> | 15 | 48 | 69 | 126 | 154 | 188 | .... | 296 | 325 | 352 | 380 |
| | <i>M</i> | 9.69 | 9.85 | 10.61 | 11.80 | 12.87 | 13.30 | .... | 13.41 | 13.14 | 12.80 | 10.31 |
| | ΔM | -0.06 | -0.40 | -0.16 | -0.62 | -0.04 | -0.05 | .... | -0.24 | -0.12 | +0.28 | -0.09 |
| | No. | 7 | 4 | 1 | 1 | 2 | 3 | .... | 2 | 3 | 2 | 4 |
| 4746 | <i>t</i> | 16 | 58 | 90 | 117 | 156 | .... | .... | 282 | 322 | 358 | 396 |
| | <i>M</i> | 9.27 | 10.85 | 12.10 | 12.85 | 13.19 | .... | .... | 14.18 | 13.70 | 13.31 | 11.23 |
| | ΔM | -0.51 | +0.37 | +0.60 | +0.64 | +0.23 | .... | .... | +0.45 | +0.38 | +1.12 | +1.22 |
| | No. | 3 | 3 | 3 | 2 | 2 | .... | .... | 1 | 2 | 3 | 1 |
| 5156 | <i>t</i> | 17 | 57 | 97 | .... | 158 | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | 10.87 | 10.41 | 12.22 | .... | 13.20 | .... | .... | .... | .... | .... | .... |
| | ΔM | +1.06 | -0.04 | +0.39 | .... | +0.18 | .... | .... | .... | .... | .... | .... |
| | No. | 2 | 1 | 2 | .... | 2 | .... | .... | .... | .... | .... | .... |
| 5566 | <i>t</i> | .... | .... | .... | .... | 174 | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | .... | .... | .... | 12.47 | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | .... | .... | .... | -0.74 | .... | .... | .... | .... | .... | .... |
| | No. | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... | .... |
| 5976 | <i>t</i> | .... | 48 | 77 | 134 | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | .... | 10.95 | 11.26 | 12.06 | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | .... | +0.74 | +0.25 | -0.54 | .... | .... | .... | .... | .... | .... | .... |
| | No. | .... | 1 | 1 | 1 | .... | .... | .... | .... | .... | .... | .... |
| 6386 | <i>t</i> | 12 | .... | 69 | .... | .... | .... | .... | .... | 329 | 374 | .... |
| | <i>M</i> | 8.73 | .... | 11.12 | .... | .... | .... | .... | .... | 12.16 | 10.86 | .... |
| | ΔM | -0.97 | .... | +0.49 | .... | .... | .... | .... | .... | -1.03 | -0.77 | .... |
| | No. | 1 | .... | 1 | .... | .... | .... | .... | .... | 3 | 1 | .... |
| 6796 | <i>t</i> | 18 | 57 | 84 | 112 | .... | .... | .... | .... | .... | .... | .... |
| | <i>M</i> | 9.66 | 10.02 | 10.66 | 11.73 | .... | .... | .... | .... | .... | .... | .... |
| | ΔM | -0.06 | -0.39 | -0.60 | -0.39 | .... | .... | .... | .... | .... | .... | .... |
| | No. | 1 | 1 | 2 | 1 | .... | .... | .... | .... | .... | .... | .... |
| Means | <i>t</i> | 16 | 53 | 85 | 121 | 159 | 188 | .... | 291 | 325 | 354 | 383 |
| | <i>M</i> | 9.70 | 10.33 | 11.46 | 12.26 | 13.00 | 13.30 | .... | 13.67 | 12.91 | 12.90 | 10.50 |
| | ΔM | -0.06 | -0.02 | +0.12 | -0.05 | -0.11 | -0.05 | .... | -0.01 | -0.34 | +0.52 | +0.17 |
| | No. | 14 | 10 | 11 | 5 | 7 | 3 | .... | 3 | 8 | 6 | 5 |

TABLE 116.—8629 Y CASSIOPEÆ. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1898 March 5 (J. D. 2414354)+410^d E. $M - m = 158^d$.

| MAXIMA. | | | | | | | MINIMA. | | | | | | |
|---------|--------------|-------|-------|-------|-------|-----|---------|--------------|-------|------|------|-------|-----|
| Epoch. | Date. | | Mag. | | Corr. | Wt. | Epoch. | Date. | | Mag. | | Corr. | Wt. |
| | Calendar. | J. D. | H. | P. | | | | Calendar. | J. D. | H. | P. | | |
| 0 | 1898 Mar. 11 | 4360 | 9.41 | 9.14 | + 6 | 7 | 1 | 1898 Nov. 4 | 4598 | 14.0 | 13.7 | - 8 | 17 |
| 1 | 1899 Apr. 8 | 4753 | 9.10 | 8.83 | -11 | 11 | 2 | 1899 Dec. 13 | 5012 | 14.2 | 13.9 | - 4 | 19 |
| 2 | 1900 June 9 | 5180 | 10.57 | 10.30 | + 6 | 7 | 3 | 1901 Feb. 16 | 5432 | .... | mc | + 6 | 4 |
| 3 | 1901 July 24 | 5590 | .... | mc | + 6 | 1 | 4 | 1902 Mar. 31 | 5840 | .... | mc | + 2 | 1 |
| 4 | 1902 Sept. 7 | 6000 | .... | mc | + 6 | 2 | 5 | 1903 May 15 | 6250 | .... | mc | + 4 | 2 |
| 5 | 1903 Oct. 10 | 6398 | 8.70 | 8.43 | - 6 | 2 | 6 | 1904 June 8 | 6640 | .... | mc | -16 | 3 |
| 6 | 1904 Nov. 27 | 6812 | 9.63 | 9.36 | - 2 | 9 | | | | | | | |

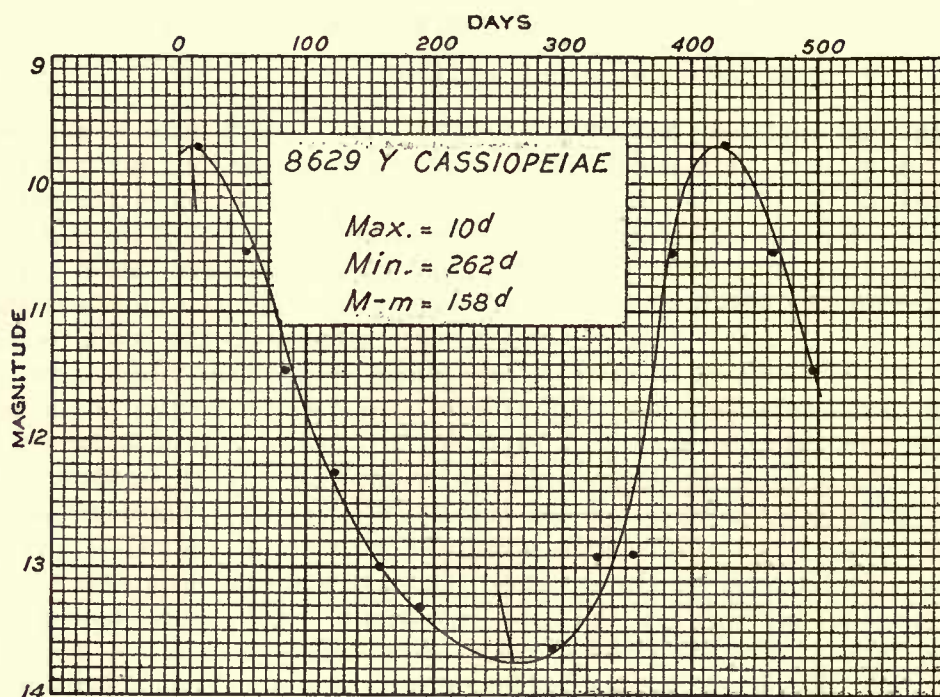


FIG. 39.—MEAN LIGHT-CURVE OF Y CASSIOPEIAE.

CHAPTER XIV.

GENERAL CONCLUSIONS.

I. PRECISION OF THE PHOTOMETER MEASURES.

The tables headed "Standard Magnitude Stars" and "Mean Magnitudes of Comparison Stars" furnish data for some important conclusions in regard to the precision of the photometric work. The method of reduction of the measures with the 6-inch, as explained on page 16, gives magnitude values for each of the standard stars which must average the same as the catalogue values. If both were perfect, the separate residuals between the catalogue and measured magnitudes would be zero. Except for systematic differences, the actual residuals represent the combined effect of the accidental errors of the two systems compared. Table 117 collects the mean values of these residuals for the three standard stars in each field for each night, expressed in hundredths of a magnitude and taken without regard to sign. The mean residual for each of the three or four nights is given separately from the Harvard and from the Potsdam catalogue values. Then follow two columns giving the means of all the nights under the headings H and P for the two systems. The next two columns give the number of nights' observations and the mean residuals of my measures among themselves. Then follow the Potsdam colors, W standing for white, G for yellow, GW for yellowish white, WG for whitish yellow, the plus and minus signs indicating a greater or less degree of color.

Before these results are discussed, it is necessary to find if there is a systematic difference, due to color, between my measures and the two catalogues. The standard stars and their residuals were arranged according to color, and means taken of five groups each containing at least four stars, 28 stars in all. It was found that I see white stars fainter and yellow stars brighter than the catalogues, the range between white and whitish yellow stars being 0.20 as compared with the Harvard and 0.07 as compared with the Potsdam values. Correcting the 28 stars for the color effect, the mean residual was reduced from 0.12 to 0.11 for the Harvard system, but remained at 0.06 for the Potsdam system, an effect so slight that it may be disregarded in the discussion.

The results of Table 117 can now be discussed.

(1) *Considering the agreement of my measures among themselves.*—The average difference between a single night's magnitude of a star and the mean of the three (or in one case four) nights, ranges from 0.02 to 0.07 when the means for the three stars in the field are considered. The residuals for the separate stars range from 0.01 to 0.11; the general average of the residuals is ± 0.04 , corresponding to a probable error in the mean of a little less than 0.03 magnitude. The extreme values of the probable error are ± 0.01 and ± 0.05 for the separate stars.

For comparison, in the three parts of the Potsdam catalogue the probable errors of the mean of two nights are ± 0.057 , ± 0.040 , and ± 0.037 .

(2) *The agreement of my measures with the Potsdam catalogue.*—The mean residuals for the different fields range from 0.03 to 0.11, averaging 0.07 (the maximum residual for a single star is 0.24). This is just about the residual which would be expected if the two sets of measures were of equal precision, as the residual 0.07 is the combined accidental error of the two sets of measures.

(3) *The agreement of my measures with the Harvard values.*—The residuals range from 0.05 to 0.28, with an average value of ± 0.15 . If a color correction were applied this would be reduced to 0.14, but would still be double the residual from the Potsdam catalogue. It is realized that great caution should be used in drawing general conclusions from the measures of so few stars; nevertheless, the fact that the residuals from the Potsdam system are persistently (except for S Lyræ) smaller than from the Harvard system seems to admit of but one explanation, the greater accuracy of the Potsdam measures, and the close approach to the Potsdam accuracy in the measures of the present series. The basing of the Harvard measures on polar stars would naturally introduce greater local errors than would be the case in the Potsdam measures, which are based on standards near the measured fields. This doubtless accounts for part of the difference.

TABLE 117.—STANDARD MAGNITUDE STARS. AGREEMENT OF MAGNITUDE RESULTS.

| Field. | | Residuals between my measures and the catalogue magnitudes. | | | | | | | | | | My measures inter se. | | Potsdam Colors. | | |
|-------------|-------------------|---|----|----|----|----------|----|----|----|-------|----|-----------------------|---------|-----------------|-----|-----|
| | | Harvard. | | | | Potsdam. | | | | Mean. | | No. nights. | Mean Δ. | | | |
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | H. | P. | | | | | |
| 103 | T Andromedæ... | 16 | 19 | 19 | .. | 7 | 10 | 10 | .. | 18 | 9 | 3 | 3 | GW- | W- | WG- |
| 267 | V Andromedæ... | 9 | 13 | 8 | .. | 2 | 4 | 2 | .. | 10 | 3 | 3 | 2 | W- | W- | W |
| 787 | W Andromedæ... | 6 | 2 | 17 | .. | 8 | 10 | 7 | .. | 8 | 8 | 3 | 6 | GW- | GW- | GW |
| 4315 | R Comæ | 14 | 2 | 11 | .. | 10 | 12 | 2 | .. | 9 | 8 | 3 | 6 | WG | GW | G- |
| 5798 | RU Herculis | 13 | 7 | 11 | .. | 3 | 3 | 8 | .. | 10 | 5 | 3 | 4 | GW- | GW- | GW- |
| 6100 | RV Herculis | 14 | 16 | 14 | .. | 1 | 5 | 3 | .. | 15 | 3 | 3 | 3 | W | WG | WG- |
| 6894 | S Lyræ | 4 | 8 | 3 | .. | 5 | 9 | 8 | .. | 5 | 7 | 3 | 3 | GW | GW | W |
| 7220 | S Cygni | 29 | 18 | 21 | .. | 18 | 6 | 10 | .. | 23 | 11 | 3 | 7 | W- | GW- | W |
| 7269 | SX Cygni | 12 | 16 | 12 | .. | 9 | 15 | 3 | .. | 13 | 9 | 3 | 5 | W | GW | W |
| 7458 | V Delphini | 27 | 22 | 21 | .. | 7 | 13 | 11 | .. | 23 | 10 | 3 | 3 | GW | WG | WG |
| 8518 | Z Cassiopeæ ... | 32 | 26 | 32 | 20 | 12 | 6 | 11 | 1 | 28 | 10 | 4 | 4 | WG | G- | |
| 8629 | Y Cassiopeæ ... | 8 | 15 | 16 | .. | 6 | 6 | 6 | .. | 13 | 6 | 3 | 5 | G- | WG | G |
| Means | | .. | .. | .. | .. | .. | .. | .. | .. | 15 | 7 | .. | 4 | | | |

PRECISION OF MEASURES WITH THE DIFFERENT APERTURES.

The average residual, expressed in hundredths, of the magnitudes of the measured stars (not including the standards) from the mean of all the nights, is given in the following table for the different apertures separately:

TABLE 118.—MAGNITUDE RESIDUALS FOR MEASURED STARS.

| Aperture. | | 6 | 12 | 40 | Mean. |
|-----------|-------------------|---|----|----|-------|
| 103 | T Andromedæ... | 9 | 9 | 11 | 10 |
| 267 | V Andromedæ... | 8 | 10 | 7 | 8 |
| 787 | W Andromedæ... | 7 | 4 | 6 | 6 |
| 4315 | R Comæ | 8 | 6 | 11 | 8 |
| 5798 | RU Herculis | 8 | 7 | 13 | 9 |
| 6100 | RV Herculis | 5 | 6 | 15 | 9 |
| 6894 | S Lyrae | 4 | 6 | 12 | 7 |
| 7220 | S Cygni..... | 4 | 8 | 18 | 10 |
| 7269 | SX Cygni..... | 7 | 5 | 12 | 8 |
| 7458 | V Delphini..... | 7 | 6 | 9 | 7 |
| 8518 | Z Cassiopeiae ... | 8 | 7 | 5 | 7 |
| 8629 | Y Cassiopeiae ... | 6 | 5 | 14 | 8 |
| Mean..... | | 7 | 7 | 11 | 8 |

II. LIMIT OF VISION OF THE 6-, 12-, AND 40-INCH TELESCOPES.

An interesting result of the present investigation is the photometric magnitude of the limit of vision of the three telescopes used. The estimates of the limit are given for each field in the table "Visual Comparisons of the Variable" in steps below the faintest comparison star visible. Table 119 collects the most reliable of these estimates, made in good seeing and classified for each aperture according to the ocular used, as it is well known that a higher magnifying power will show fainter stars. Following the columns giving the field, date of observation, and estimate of limit, are two magnitude columns on the H. C. O. system, giving the photometric magnitude of the star used in the estimate and the resulting apparent magnitude of the limit, using as the value of one step 0.14. The next two columns give the zenith distance and the reduction to the zenith resulting from atmospheric absorption. The final two columns give the zenith magnitude of the limit, both in the Harvard and Potsdam systems. Using Pogson's formula

$$\text{Limit of vision} = 9.0 + 5 \log \text{aperture in inches}$$

we have the following comparison between calculated and observed limits:*

| | |
|------------------------------------|----------------------|
| 6-inch, calculated..... | 12.89. |
| 6-inch, observed, ocular 150..... | 12.90 Harvard scale. |
| 6-inch, observed, ocular 150..... | 13.02 Potsdam scale. |
| 12-inch, calculated..... | 14.40. |
| 12-inch, observed, ocular 275..... | 14.27 Harvard scale. |
| 12-inch, observed, ocular 275..... | 14.57 Potsdam scale. |
| 40-inch, calculated..... | 17.01. |
| 40-inch, observed, ocular 750..... | 16.8 Harvard scale. |
| 40-inch, observed, ocular 750..... | 17.1 Potsdam scale. |

* Compare provisional results from six fields in Table 4, page 10.

6-INCH. OCULAR 150.

| 6-INCH, OCULAR 150. | | | | | | | | |
|---------------------|--------------|----------------|--------------|--------|------------|------|----------------------|-------|
| Field. | Date. | Estimate | Magnitude H. | | Reduction. | | Corrected Magnitude. | |
| | | | Star. | Limit. | Z. | Cor. | H. | P. |
| | <i>y m d</i> | | | | | | | |
| T Andromedæ | 96 1 13 | 3 < <i>k</i> | 11.85 | 12.27 | 30° | .03 | 12.30 | 12.38 |
| T Andromedæ | 97 9 20 | <i>x</i> | 13.12 | 13.12 | 51 | .13 | 13.25 | 13.33 |
| T Andromedæ | 00 1 24 | <i>x</i> | 13.12 | 13.12 | 40 | .06 | 13.18 | 13.26 |
| T Andromedæ | 97 8 19 | 4 < <i>k</i> | 11.85 | 12.35 | 63 | .28 | 12.63 | 12.71 |
| T Andromedæ | 00 9 15 | 5 < <i>k</i> | 11.85 | 12.55 | 63 | .28 | 12.83 | 12.91 |
| V Andromedæ | 97 9 20 | 4 < <i>n</i> | 12.24 | 12.76 | 56 | .18 | 12.94 | 13.23 |
| V Andromedæ | 97 11 16 | 5 < <i>d</i> | 11.83 | 12.53 | 24 | .02 | 12.55 | 12.84 |
| V Andromedæ | 98 1 16 | <i>g</i> | 12.34 | 12.34 | 24 | .02 | 12.36 | 12.65 |
| V Andromedæ | 98 1 18 | 1 < <i>g</i> | 12.34 | 12.48 | 24 | .02 | 12.50 | 12.79 |
| W Andromedæ | 99 6 10 | 1 < <i>h</i> | 11.80 | 11.94 | 61 | .25 | 12.19 | 12.60 |
| W Andromedæ | 99 7 29 | 2 < <i>h</i> | 11.80 | 12.08 | 70 | .45 | 12.53 | 12.94 |
| W Andromedæ | 03 10 11 | <i>u</i> | 12.42 | 12.42 | 52 | .14 | 12.56 | 12.97 |
| R Comæ | 94 5 11 | 1 < <i>b</i> | 12.29 | 12.43 | 23 | .02 | 12.45 | 12.75 |
| R Comæ | 05 3 24 | <i>u</i> | 12.81 | 12.81 | 46 | .09 | 12.90 | 13.20 |
| R Comæ | 05 3 24 | <i>z</i> | 12.83 | 12.83 | 46 | .09 | 12.92 | 13.22 |
| RU Herculis | 97 8 20 | <i>p</i> | 13.42 | 13.42 | 34 | .04 | 13.46 | 13.73 |
| RU Herculis | 97 9 14 | <i>p</i> | 13.42 | 13.42 | 40 | .06 | 13.48 | 13.75 |
| RU Herculis | 97 10 14 | 1 < <i>p</i> | 13.42 | 13.56 | 55 | .17 | 13.73 | 14.00 |
| RU Herculis | 97 10 23 | 2-3 < <i>n</i> | 12.75 | 13.10 | 62 | .26 | 13.36 | 13.63 |
| RU Herculis | 98 8 27 | 3-4 < <i>m</i> | 12.40 | 12.89 | 40 | .06 | 12.95 | 13.22 |
| RU Herculis | 98 8 27 | 2 < <i>n</i> | 12.75 | 12.93 | 40 | .06 | 12.99 | 13.26 |
| RV Herculis | 97 9 21 | 3-4 < <i>s</i> | 12.67 | 13.16 | 26 | .02 | 13.21 | 13.46 |
| RV Herculis | 97 9 25 | 4 < <i>s</i> | 12.67 | 13.19 | 26 | .05 | 13.24 | 13.49 |
| RV Herculis | 97 10 14 | 3 < <i>s</i> | 12.67 | 13.09 | 36 | .05 | 13.14 | 13.39 |
| RV Herculis | 98 4 26 | 3 < <i>s</i> | 12.67 | 13.09 | 58 | .20 | 13.29 | 13.54 |
| S Lyrae | 96 12 23 | <i>x</i> | 12.18 | 12.18 | 65 | .32 | 12.50 | 12.92 |
| S Lyrae | 97 9 22 | 2-3 < <i>z</i> | 12.82 | 13.17 | 21 | .01 | 13.18 | 13.60 |
| S Lyrae | 97 11 16 | <i>z</i> | 12.82 | 12.82 | 41 | .07 | 12.89 | 13.31 |
| S Lyrae | 97 12 29 | <i>z</i> | 12.82 | 12.82 | 73 | .56 | 13.38 | 13.80 |
| S Cygni | 94 6 6 | <i>x</i> | 11.95 | 11.95 | 48 | .11 | 12.06 | 12.31 |
| S Cygni | 94 6 20 | 2 < <i>x</i> | 11.95 | 12.23 | 41 | .07 | 12.30 | 12.55 |
| S Cygni | 94 7 2 | 2 < <i>x</i> | 11.95 | 12.23 | 32 | .03 | 12.26 | 12.51 |
| S Cygni | 00 10 26 | <i>y</i> | 12.31 | 12.31 | 16 | .00 | 12.31 | 12.56 |
| V Delphini | 94 6 28 | 1 < <i>a</i> | 12.13 | 12.27 | 54 | .16 | 12.43 | 12.69 |
| V Delphini | 94 8 26 | 2 < <i>a</i> | 12.13 | 12.41 | 34 | .04 | 12.45 | 12.71 |
| V Delphini | 97 8 27 | 3-4 < <i>a</i> | 12.13 | 12.62 | 27 | .02 | 12.64 | 12.90 |
| V Delphini | 99 7 8 | 4-5 < <i>a</i> | 12.13 | 12.76 | 49 | .11 | 12.89 | 13.13 |
| Z Cassiopeia | 99 6 10 | <i>k</i> | 12.99 | 12.99 | 40 | .06 | 13.05 | 12.94 |
| Z Cassiopeia | 00 1 1 | 1 < <i>k</i> | 12.99 | 13.13 | 18 | .01 | 13.14 | 13.03 |
| Y Cassiopeia | 98 9 7 | <i>z</i> | 14.01 | 14.01 | 32 | .03 | 14.04 | 13.77 |
| Y Cassiopeia | 98 10 5 | <i>z</i> | 14.01 | 14.01 | 32 | .03 | 14.04 | 13.77 |
| Y Cassiopeia | 98 11 5 | <i>a</i> | 13.53 | 13.53 | 24 | .02 | 13.55 | 13.26 |
| Mean | | | | | | | 12.90 | 13.02 |

| 6-INCH, OCULAR 200. | | | | | | | | |
|---------------------|---------|----------------|-------|-------|----|-----|-------|-------|
| RV Herculis | 99 1 10 | 3-4 < <i>s</i> | 12.67 | 13.16 | 56 | .18 | 13.34 | 13.59 |
| RV Herculis | 99 7 8 | 3-4 < <i>s</i> | 12.67 | 13.16 | 16 | .00 | 13.16 | 13.41 |
| RV Herculis | 00 1 20 | 4 < <i>s</i> | 12.67 | 13.19 | 68 | .39 | 13.58 | 13.83 |
| Z Cassiopeia | 99 1 4 | <i>k</i> | 12.99 | 12.99 | 32 | .03 | 13.02 | 12.91 |
| Z Cassiopeia | 99 10 2 | 1 < <i>k</i> | 12.99 | 13.13 | 29 | .03 | 13.16 | 13.05 |
| Mean | | | | | | | 13.25 | 13.36 |

TABLE 119. LIMIT OF VISION.—Continued.

| 12-INCH, OCULAR 67. | | | | | | | | |
|----------------------|------------------|--------------------|--------------|--------|------------|------|----------------------|-------|
| Field. | Date. | Estimate | Magnitude H. | | Reduction. | | Corrected Magnitude. | |
| | | | Star. | Limit. | Z. | Cor. | H. | P. |
| RV Hercules | y m d 04 8 11 | 4 < a | 13.30 | 13.86 | 26° | .02 | 13.88 | 14.13 |
| OCULAR 80. | | | | | | | | |
| W Andromedæ.... | 03 10 13 | z | 13.34 | 13.34 | 70 | .45 | 13.79 | 14.20 |
| Z Cassiopeiæ..... | 00 2 25 | 4 < k | 12.99 | 13.55 | 48 | .11 | 13.66 | 13.55 |
| Z Cassiopeiæ..... | 00 2 25 | 1 < x | 13.38 | 13.52 | 48 | .11 | 13.63 | 13.52 |
| Mean..... | | | | | | | 13.69 | 13.74 |
| OCULAR 275. | | | | | | | | |
| V Andromedæ ... | 98 7 25 | C | 13.82 | 13.82 | 46 | .09 | 13.91 | 14.20 |
| R Comæ | 00 4 4 | γ | 14.17 | 14.17 | 34 | .04 | 14.26 | 14.56 |
| R Comæ | 00 4 4 | 1 < β | 14.08 | 14.22 | 34 | .04 | 14.26 | 14.56 |
| RU Hercules | 00 3 7 | w' | 14.68 | 14.68 | 40 | .06 | 14.74 | 15.01 |
| RU Hercules | 00 4 4 | w' | 14.68 | 14.68 | 22 | .01 | 14.69 | 14.96 |
| RV Hercules | 00 4 4 | β | 14.75 | 14.75 | 20 | .01 | 14.76 | 15.01 |
| RV Hercules | 00 4 4 | η | 14.26 | 14.26 | 20 | .01 | 14.27 | 14.52 |
| S Lyræ | 00 4 4 | 8-10 < z | 12.82 | 14.10 | 41 | .07 | 14.17 | 14.59 |
| S Lyræ | 00 4 4 | α | 14.01 | 14.01 | 41 | .07 | 14.08 | 14.50 |
| V Delphini | 01 11 1 | 3 < γ | 13.50 | 13.92 | 51 | .13 | 14.05 | 14.31 |
| V Delphini | 01 11 1 | ω | 13.73 | 13.73 | 51 | .13 | 13.86 | 14.12 |
| Mean..... | | | | | | | 14.27 | 14.57 |
| 40-INCH, OCULAR 237. | | | | | | | | |
| V Delphini | 02 4 12 | 4 < A | 16.2 | 16.7 | 62 | .06 | 16.8 | 17.2 |
| V Delphini | 02 4 12 | 2-3 < π | 15.2 | 15.6 | 62 | .06 | 15.6 | 15.8 |
| Mean..... | | | | | | | 16.2 | 16.5 |
| OCULAR 350. | | | | | | | | |
| RV Hercules | 02 2 5 | 6 < k | 15.50 | 16.25 | 51 | .13 | 16.38 | 16.63 |
| OCULAR 450. | | | | | | | | |
| V Delphini | 00 10 16 | 1 ^m < μ | 15.3 | 16.1 | 34 | .04 | 16.3 | 16.6 |
| S Cygni | 05 11 18 | 5-6 < δ | 15.48 | 16.25 | 16 | .00 | 16.25 | 16.50 |
| OCULAR 750. | | | | | | | | |
| V Delphini | 00 8 29 | ½ ^m < A | 16.2 | 16.7 | 51 | .13 | 16.8 | 17.1 |

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